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ABSTRACT

An instructor's manual and student activity guide on gas welding are provided in this set of prevocational education materials which focuses on the occupational cluster of trade and industry. (This set of materials is one of ninety-two prevocational education sets arranged around a cluster of seven vocational offerings: agriculture, home economics, distributive education, health occupations, world of work, trade and industry, and office occupations.) The instructor's guide is organized into the following elements: title of activity, duration of activity (four to ten periods), activity goals, seven instructional objectives, related vocational clusters, and activity implementation (description, materials needed, safety considerations, teacher preparation prior to class, during the class, follow-up activities, answer key to student check point activities, masters for duplication [e.g., a handout on the proper setup and use of an oxygen-acetylene welding outfit, student checklist booklet] and a set of transparencies). The student activity guide, focusing on the production of a metal belt buckle, provides step-by-step instructions (narrative and illustrations) for completing each instructional objective (e.g., cutting, shaping and deburring, drilling, welding, and finishing metal). At the end of each set of instructions is a student check point (evaluation activity). Occupational descriptions for a gas welding-machine operator and a gas welder conclude the document. (JH)

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ED169357

T&I – GAS WELDING

Kit No. 68

INSTRUCTOR'S MANUAL

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1978

CE 020 542

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NATIONAL INSTITUTE OF EDUCATION

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TITLE OF ACTIVITY

Kit No. 68, T&I – Gas Welding

DURATION

Main Activity: 3 – 6 periods
Follow-up Activity: 1 – 4 periods

GOALS

The student will become familiar with cutting metal.

The student will learn how to shape and deburr metal.

The student will become familiar with drilling metal.

The student will learn how to bend metal.

The student will learn how to join metals together by welding.

The student will become familiar with finishing metal.

INSTRUCTIONAL OBJECTIVES

Given the necessary tools and equipment, the student will cut one piece of steel 1/8" x 2 1/2" x 3 1/2" (.3175 x 6.35 x 8.89 cm) and two peices of 1/8" filler rod – one 3" (7.62 cm) long and another 1" (2.54 cm) long.

Given the necessary tools and equipment, the student will shape and deburr the buckle blank until the corners and edges are round and smooth.

Given the proper tools and equipment, the student will locate and drill three (3) holes to the proper diameter for mounting belt holder and hook.

Given the proper tools and equipment, the student will bend the 3" (7.62 cm) piece of filler rod to fit the buckle blank.

Given the necessary tools and equipment, the student will properly assemble the belt buckle for welding.

Given the proper tools, equipment and instruction, the student will safely weld the belt holder and hook to the buckle blank.

Given the necessary tools and equipment, the student will finish the back side of the buckle and prepare the front to be covered.

VOCATIONAL CLUSTERS

Health Occupations

ACTIVITY IMPLEMENTATION

A. Activity Description

This activity is designed to expose the student to cutting, filing, bending, drilling, welding, and finishing metal. By combining these activities, a useful metal belt buckle will be the end product. A general group meeting will be held prior to the beginning of the activity. Safety and the proper setup of the oxygen-acetylene welding outfit will be among the topics emphasized. Using an activity booklet, students will then follow step-by-step instruction moving from one color coded area to the next. Students will complete a checklist for each color area which will be corrected by the instructor before moving to the next area. There are seven(7) areas to be completed. The necessary tools and equipment for successful completion of each color area will be located within that area, with the exception of vises which will be mounted on a table in the center of your operation. Students will be given one Student Activity Guide and one Student Checklist Booklet to begin the activity.

B. Safety

Safety will be listed under color area to simplify instruction. A poster(s) on safety for each area should be mounted within that work area.

<u>Black Area: Cutting</u>

Care should be taken when sawing through metal not to slip and cut hands on edges of metal.

Yellow Area: Shaping & Deburring

Care should be taken when filing sharp edges of metal. Bad cuts may occur.

Blue Area: Drilling

Safety glasses must be worn when drilling metal.

Care should be taken not to pop through buckle blank and break bit when drilling.

Brown Area: Welding

Safety goggles, gloves and aprons must be worn while welding.

Do not exceed 5 psi of working pressure on acetylene gauge when setting up or operating welding outfit.

Always hold torch pointed down and away from people and tanks when lighting.

Do not allow acetylene fumes to free flow – very harmful to breathe and very combustible.

If popping occurs pull flame away from metal and allow metal to cool somewhat.

Beware of hot metal, while appearing cool, metal may still be very hot.

Handle hot work only with pliers provided.

Purple Area: Finishing

Paint thinner should be kept in a metal container.

If thinner gets in eyes or irritates skin, flush with water immediately. Contact and inform instructor.

Keep spray paint or finish away from open flames.

Spray finish in well ventilated area. Fumes are harmful to breathe. Example: spray by an open window.

C. Materials Required

1. Audio Visual Equipment
   Overhead projector
   Screen or wall space
2. Technical Equipment (for 25 students)
   4 Vises
   8 C-clamps
   8 Rulers – 12" (30.48 cm)
   4 T-squares
   4 Hacksaws
   6 Draw files
   4 Punches
   4 Ball pein hammers
   2 pr. Safety glasses
   4 Buckle blank patterns
   1 Drill (1/4")
   4 Drill bits (1/8")
   1 Drop cord
   4 Pliers (needle nose)
   4 Pliers (all purpose)
   4 Pliers (linesman)
   2 Wooden dowel gauges
   2 Welding jigs
   2 Wire brushes
   Tin can (1 gallon)
   Oxygen-acetylene welding outfit. Includes: tanks, regulators, hoses, torch and tips, strikers, and goggles.
   2 pr. Welding goggles
   2 pr. Welding gloves
   2 each Welding aprons
   4 Replacement blades for hacksaw
   First aid kit
   7 Signs for color areas
      1–Black area
      2–Yellow area
      3–Blue area
      4–Red area
      5–Green area
      6–Brown area
      7–Purple area
   7 Stands – 8" x 8" x 3/4" (20.32 x 20.32 x 1.92 cm) plywood
   7 Dowel rods – 24" x 1/2" (60.96 x 1.27 cm)
   7 Signs: Color stages
      1–Cutting stock (black)
      2–Shaping & Deburring (yellow)
      3–Drilling (blue)
      4–Bending (red)
      5–Assembly (green)
      6–Welding (brown)
      7–Finishing (purple)
   Labels: (laminated) to be taped on boxes or tables
   (1) Black Background – White Letters
      (a) steel strips
      (b) filler rod
      (c) try squares
      (d) chalk
      (e) rulers, 12" (30.48 cm)
      (f) hacksaws

(2) Yellow Background – Black Letters
(a) draw files
(3) Blue Background – White Letters
(a) pencils
(b) punches
(c) ball pein hammers
(d) safety glasses
(e) drop cord
(f) draw files
(g) 1/4" drill with 1/8" bit
(h) buckle pattern
(4) Red Background – White Letters
(a) linesman pliers
(5) Green Background – White Letters
(a) needle nose pliers
(b) wooden gauge
(6) Brown Background – White Letters
(a) pliers
(b) welding jig
(c) strikers
(d) welding goggles
(e) welding gloves
(f) welding aprons
(g) oxygen-acetylene welding outfit
(7) Purple Background – White Letters
(a) rulers
(b) chalk
(c) hacksaw
(d) draw files
(e) wire brushes
(f) spray paint
(g) rags
(h) pliers
(i) paint thinner
(j) newspaper
5 Safety posters

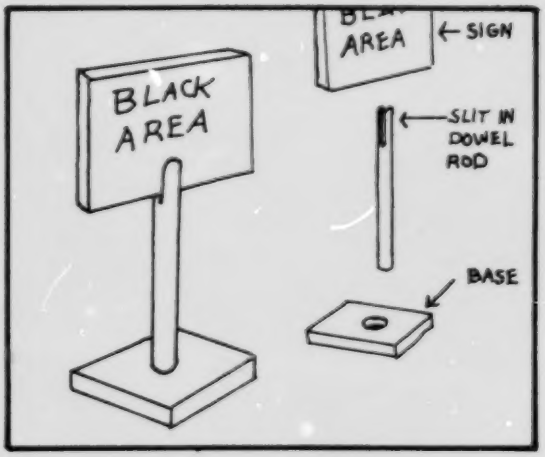
3. Expendable Materials (for 25 students)
Rags (arm full)
Thinner (1 pt.)
Newspaper (stack)
Spray paint (1 can)
Bricks (6)
Chalk (box)
Pencils (4)
Filler rod (7) 1' x 1/8" rods
Strips of steel (9) 1' x 2 1/2" x 1/8" strips
Slide boxes or other boxes for tools and equipment

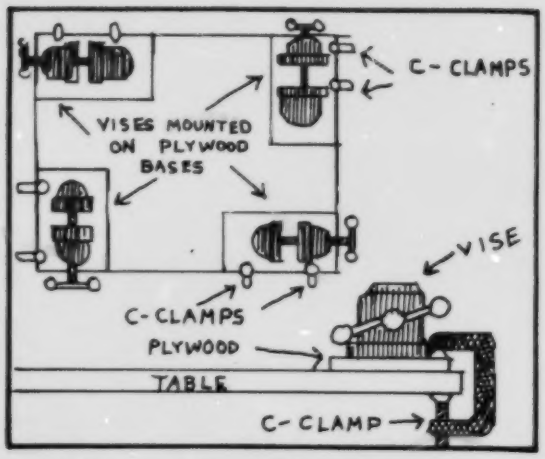
D. **Preparation Prior to Class**

Obtain the following materials:
Rags
Thinner
Newspaper
Spray paint
Bricks
Chalk
Pencils
Filler rod 1/8"
Strips of steel
Shoe boxes or other boxes (These boxes can be brought from home or gathered from school. They are to hold the tools for each color area.)
Equipment needed for welding
Overhead projector
Screen or wall space for viewing

Have ready the number of student activity guides needed for class.

Assemble color area signs.
(a) insert 1/2" (1.27 cm) dowel rod into 8" x 8" x 3/4" base
(b) insert signs (Example: Black Area) in top of 1/2" (1.27 cm) dowel rod





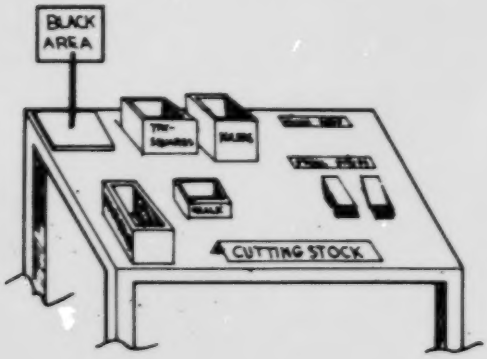
Set up vise work table using vises mounted on plywood and c-clamps. Clamp vises to your table.

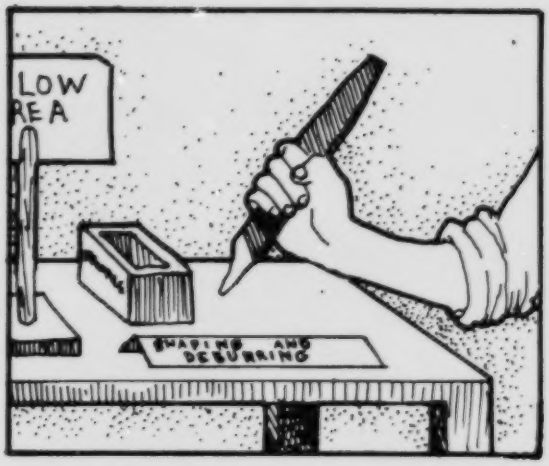
Decide if you are going to use the oxygen-acetylene welding outfit in your existing facility or move to another option for welding. Some options include:

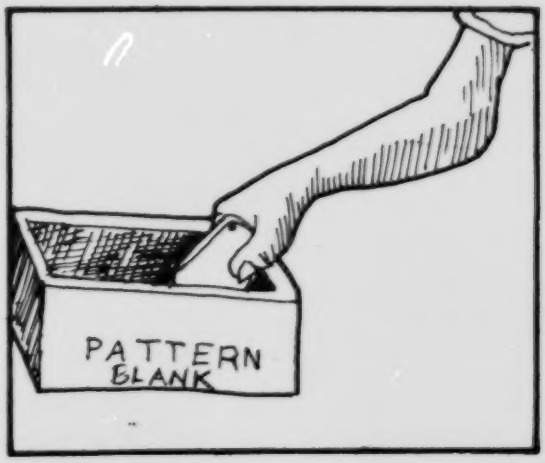
(a) a trip to your area vocational center to use their facilities.

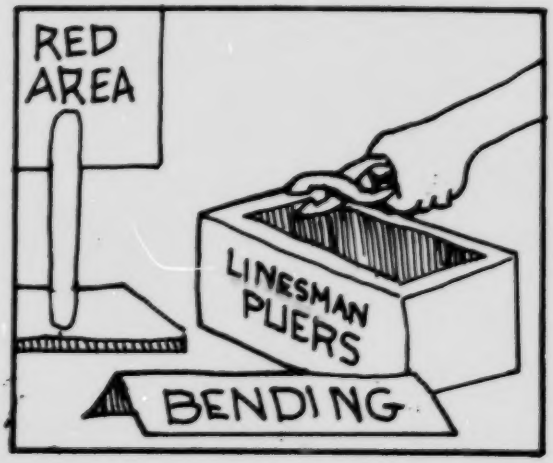
(b) your area vocational center transporting an oxygen-acetylene welding outfit to your school and supervising the welding area.

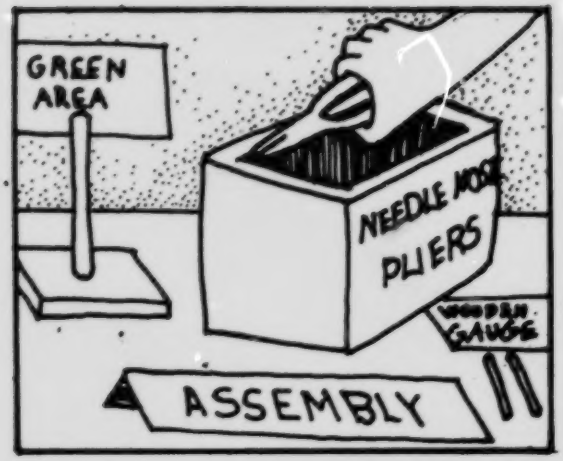
Set up each area by using the following illustrations on work areas as a guide. All tools and materials will be listed and shown on table. (Remember these are only suggestions; fit them to your needs.)

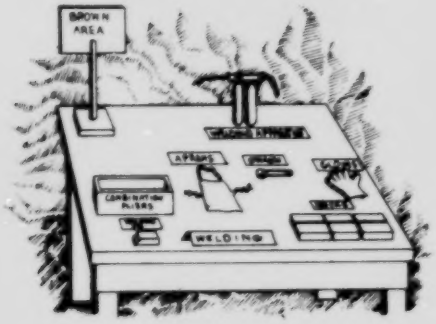


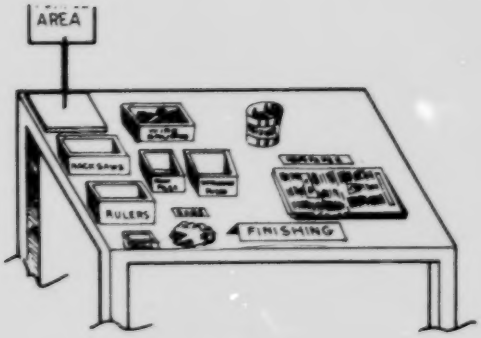




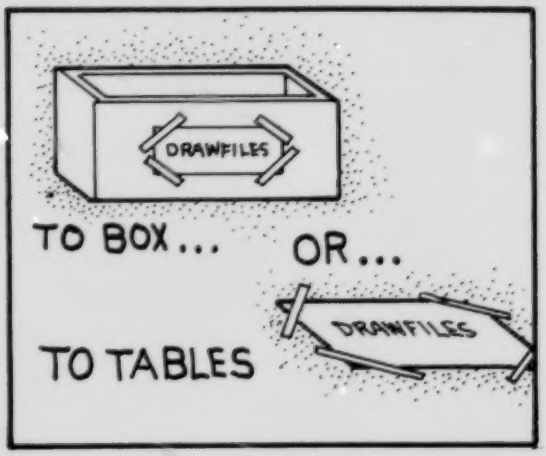








Tape laminated labels to boxes or the tables. These laminated labels are color coded for each area.



Duplicate from masters provided the student color checklist for each area and staple together in booklet form. One booklet for each student is necessary.

Duplicate VIEW Fact Sheet – one for each student plus a few extra.

Duplicate Interview Survey Sheet – one for each student plus a few extra.

Group transparencies for introduction to class.

Set up overhead projector for viewing. Use screen if available or blank wall space.

If you choose to use the oxygen acetylene welding outfit at your school, set it up for a class demonstration.

Using the teacher handout, "Proper Set Up and Use of O_2 - Acetylene Welding Outfit," practice setting welding outfit up and lighting torch. Several times may be necessary before you are ready to demonstrate.

If you are quite competent in the setup and use of oxygen-acetylene welding, arrange the welding practices to fit your needs.

NOTE: The teacher's handout,"Proper Set Up and Use of O_2-Acetylene Welding Outfit," and the Student Activity Guide describing proper setup and use of oxygen-acetylene welding outfits are two correct and safe ways to setup and use gas welding. However, they are not the only ways to safely setup and use oxygen-acetylene welding. Your past experience and use with oxygen-acetylene welding may differ somewhat and certain steps or procedures may change.

The processes and steps offered are safe if followed. You may adapt your ideas if necessary, but do not stray from the safety points noted.

E. **During Class Session**

1. First Session

a. Handout one Student Activity Guide and Checklist Booklet. Inform students not to write in Student Activity Guide; only the Checklist Booklet is to be written in.

b. Introduce Activity

Transparency I. This activity is derived from the metals industry. It deals with some basic processes involved in working with metal.

Transparency II. By combining the processes of cutting, shaping, drilling, bending, welding and finishing you will manufacture a useful end product.

Transparency III. This product will be a metal belt buckle; later to be covered with some material of your choice.

Transparency IV. When looking at this flow chart of the different work areas, please note that each area is identified by a color. You will flow from each area to the next until the activity is complete.

Transparency V. At each area, the Blue Area for example, all the tools and equipment necessary for the successful completion of that area are located within that area, with the exception of the vises used to clamp your work.

Transparency VI. The vises are located on a table in the center of your work area.

Transparency VII. Let's look at page 9 in our manual, the Blue Area – Drilling. Notice a picture of that area and a step-by-step instruction following. After successful completion of that area, you must answer the appropriate checklist, in this case the Blue Checklist located in your Checklist Booklet.

Transparency VIII. You will complete each answer and have the instructor check your work before proceeding to the next color area. As you can see, you work in each color area until you have successfully completed it. What about safety? Let's look at a few safety rules we must be aware of. To simplify, they are listed under each color that they pertain to. Also they will be listed on a poster located within that color area.

Transparency IX. Care should be taken when sawing through metal not to slip and cut hands on edges of material.

Transparency X. Care should be taken when filing sharp edges of metal. Bad cuts may occur if you slip.

Transparency XI. Safety glasses must be worn when drilling metal. Care should be taken not to pop through buckle blank when drilling. You could break the bit.

Transparency XII. Safety goggles, gloves and aprons must be worn while welding. Do not exceed 5 psi of working pressure on acetylene gauge when setting up or welding.

Transparency XIII. Always hold torch pointed down and away from people and tanks when lighting. Do not allow acetylene fumes to free flow from torch. Fumes are very harmful to breathe, as well as being very combustible.

Transparency XIV. If popping of metal occurs, pull torch flame away from metal and allow metal to cool somewhat. Beware of hot metal. While appearing cool, metal may still be very hot. Severe burns could occur. Handle hot work only with pliers provided.

Transparency XV. Paint thinner should be kept in a metal container. If thinner gets in eyes or irritates skin, flush immediately with water. Then contact and inform instructor. Spray finish in well ventilated area. Fumes are harmful to breathe and very combustible. Example: Spray by an open window.

Transparency XVI. With these safety rules in mind let's look at the proper setup and use of the oxygen-acetylene welding outfit.

INSTRUCTOR'S NOTE: Proceed with demonstration using your teacher handout if needed. Note the safety rules as you progress.

Continue demonstration until you reach a neutral flame.....

Transparency XVII. This is the neutral flame. Notice the small blue tip. The hottest part of this flame is located at the end of the blue tip. If the flame suddenly goes out, turn acetylene valve clockwise at torch until valve is closed. Turn oxygen off by a clockwise motion. For example: increase oxygen until flame goes out.

NOTE: Now, demonstrate by closing acetylene and oxygen valves. You will relight the torch in the same manner as you did before.

INSTRUCTOR'S NOTE: Demonstrate – Relight the torch. Once you have finished welding, shut your welding outfit down.

INSTRUCTOR'S NOTE: Demonstrate – Use Teacher Handout.

c. Open class for discussion. Answer questions that students may have.
d. Take up Student Activity Guide and Student Checklist Booklet.
e. Option 2. If your laboratory does not have an oxygen-acetylene welder you may use an oxygen welder torch. This is an inexpensive portable unit. The operation of this is simple and requires little maintenance. If you utilize this system omit Objective VI and proceed to Objective VII.

2. Second Session

a. Hand out Student Activity Guide.
b. Hand out Student Checklist Booklets.
c. Inform students not to write in Student Activity Guide.
d. Oversee the activity and advise only where needed.
e. Have students turn in Student Activity Guide and Checklist Booklet at end of period.

3. Third Session

a. Hand out Student Activity Guide.
b. Hand out Student Checklist Booklets.
c. Move any tools: Example hacksaws, rulers and drawfiles used the day before, that will not be used today, to another color area. For instance from the Black Area to the Blue Area or Purple Area. As students move through one area and complete that area, some tools will be needed in other areas.
d. Supervise activity and advise only when needed.
e. Concentrate yourself around the welding area to aid and observe students as much as possible. Remember: wear your safety glasses.
f. Have students turn in Student Activity Guide and Checklist Booklet.

4. Fourth–Sixth Session

a. Hand out Student Activity Guide.
b. Hand out Student Checklist Booklets.
c. Continue class activity until complete.

NOTE: Covering Buckle – There are simple ways to cover your buckles:

1. Pieces of tooled leather glued on with contact cement.
2. Cloth (any type) wrapped and glued on with contact cement.
3. Denim cloth (old dungarees) with an emblem silk screened or block printed on it, wrapped and glued with contact cement.
4. Wood emblems or pieces glued to buckle.
5. Ask for student ideas; they are usually pretty good.

F. Follow-up Activities

Below are several possibilities to be used as follow-up activities. At least one follow-up activity should be chosen or combine the four for a complete study.

Activity No. 1 – Have each student complete a VIEW Fact Sheet about an occupation related to welding.

Activity No. 2 – Interview Survey Sheet – Using a copy of the survey sheet, the student will interview a person currently employed in the welding field. This survey sheet can be brought to class for a topic in follow-up Activity No. 3.

Activity No. 3 – Class Discussion – Each student will describe verbally their likes and dislikes of the activity they completed. Discussion of Activity No. 2 and No. 4 could also be used.

Activity No. 4 – Using the newspaper or possibly a local job service, the student will locate and record advertisements for jobs relating to welding.

ANSWER KEY

Black Area Checklist:

1. Yes
2. Yes
3. B

Yellow Area Checklist

1. Yes
2. Yes
3. No
4. Yes

Blue Area Checklist

1. Yes
2. Yes
3. Yes
4. Yes
5. B

Red Area Checklist

1. Yes
2. Yes

Green Area Checklist

1. Yes
2. Yes
3. Yes

Brown Area Checklist

1. Yes
2. No
3. No
4. B
5. A
6. B
7. Loose
8. Yes

Purple Area Checklist

1. Yes
2. Yes
3. Yes
4. B

MASTERS FOR DUPLICATION

VIEW Fact Sheet
Interview Survey Sheet
Teacher Handout – Proper Setup and Use of O_2-Acetylene Welding Outfit
Student Checklist Booklet

VIEW FACT SHEET

NAME _____ CLASS _____ OCCUPATION _____

A. List the advantages (good points) of this occupation (job).

B. List the disadvantages (bad points) of this occupation (job).

C. List three things you should know to do this occupation (job).
1.
2.
3.

D. What type of education should you get to be prepared (do) for this occupation (job)?

E. What courses must you take to go into this occupation (job)?

F. What do you think your future in this occupation (job) will be?

G. What wage can you expect in this occupation (job)?

H. What are the working hours of this occupation (job)?

I. To learn more about this occupation (job), write to:

J. Using a scale of 1 to 5, circle the number that measures your interest in this occupation (job) as a possible career.

I don't like it. ← 1 2 3 4 5 → I like it.

INTERVIEW SURVEY SHEET

Name of Interviewer: _____

Name of Person Interviewed: _____

Age: _____ Sex: _____ Title of Job: _____

Years Employed at that Job: _____
Total

Likes of Job _____

_____

_____

Dislikes of Job _____

_____

_____

Hours of work per day: _____
Average

Hourly Earnings: _____

Comments of Interviewer:

_____

_____

_____

_____

_____

_____

TEACHER HANDOUT

PROPER SET UP AND USE OF OXYGEN-ACETYLENE WELDING OUTFIT

STEP 1 – Become familiar with safety rules concerning oxygen-acetylene welding.

STEP 2 – Check fitting from tanks to regulators or gauges for both the oxygen and the acetylene. These fittings should be tight.

STEP 3 – Check fittings from gauges to hoses,

STEP 4 – from hoses to torch.

STEP 5 – Be sure tip is tight in torch.

STEP 6 – Check thumbscrew on acetylene regulator. It should be very loose. If necessary, loosen by turning counterclockwise.

STEP 7 – Make sure thumbscrew on oxygen regulator is loose and easy to turn. If necessary, loosen.

STEP 8 – Open acetylene tank valve 1/4 of a turn.

STEP 9 – Open oxygen tank valve all the way.

STEP 10 – Check acetylene and oxygen adjustment valve at torch; they should be closed. Turn clockwise to close.

STEP 11 – Turn thumbscrew on acetylene regulator clockwise until pressure reads 5 psi. SAFETY NOTE: Do not exceed 5 psi.

STEP 12 – Turn thumbscrew on oxygen regulator clockwise until pressure reads 5 psi.

Your oxygen-acetylene welding outfit is set up ready for welding.

STEP 13 – Put on a protective apron.

STEP 14 – Put on a pair of oxygen-acetylene welding goggles.

STEP 15 – Tie back any loose hair or clothing that may be in your way.

STEP 16 – Put on a pair of safety gloves.

STEP 17 – Grasp strikers in right hand.

STEP 18 – Hold torch in left hand and open acetylene valve just a little bit. SAFETY NOTE: Point torch down and away from anyone.

Proper set up and use of O_2-Acetylene welding outfit (cont'd.)

STEP 19 – Light torch with strikers.

STEP 20 – Slowly open acetylene valve until black soot disappears.

STEP 21 – Open oxygen valve slowly and bring flame down to a neutral one.

NOTE: A neutral flame appears as such.

STEP 22 – Adjust flame until very little noise is heard from it.

STEP 23 – If flame goes out, shut off valves by turning clockwise and start over.

STEP 24 – Observe tip of flame. The hottest part of this flame is at the end of the blue tip.

STEP 25 – Shut off and relight torch several times until you get use to it.

STEP 26 – Turn off acetylene valve at torch. Turn clockwise.

STEP 27 – Turn off oxygen valve at torch.

STEP 28 – Lay torch on bricks.

STEP 29 – Turn acetylene valve at tank clockwise to shut off.

STEP 30 – Turn oxygen valve off at tank.

STEP 31 – Open acetylene valve at torch to bleed acetylene line.

NOTE: Bleed means to release all the working line pressure between gauges and torch.

STEP 32 – Close acetylene valve at torch when all pressure is released.

STEP 33 – Open oxygen valve at torch and bleed pressure.

STEP 34 – Close oxygen valve at torch. Turn clockwise.

STEP 35 – Turn thumbscrew on acetylene regulator counterclockwise until screw is easy to turn.

STEP 36 – Turn thumbscrew on oxygen regulator until it is loose.

STEP 37 – Your tanks and welding outfit should be just as you started with them.

STEP 38 – Practice setting up and shutting down, if necessary.

STUDENT CHECKLIST

BOOKLET

NAME _____

STUDENT CHECKLIST

BLACK AREA – CUTTING STOCK

Answer the following questions before moving to the next area.

Check "yes" or "no."

1. Have you cut 3 pieces of material?

   yes____ no____

2. Have you placed all the tools back in their labeled boxes?

   yes____ no____

Circle best answer.

3. Why should you slow up cutting metal when you near completion?

   a. blade might break on hacksaw
   b. you could slip and cut your hand on edge of material
   c. material becomes softer and easier to cut

4. After you have answered these questions have your instructor check your work.

5. If you have successfully completed these questions move to the Yellow Area.

6. If you need to do more work return to Step 1 and start over.

STUDENT CHECKLIST

YELLOW AREA -- SHAPING AND DEBURRING

Answer the following questions before moving to the next area.

Check "yes" or "no."

1. Is your buckle blank smooth on all four sides?

   yes___ no___

2. Are the corners of the blank round?

   yes___ no___

3. Do you work back and forth with a draw file?

   yes___ no___

4. Do you work only in one direction?

   yes___ no___

5. After you have answered these questions, have your instructor check your work.

6. If you have successfully completed these questions move to the next area, the Blue Area.

7. If you need to do more work, return to Step 1 and start over.

STUDENT CHECKLIST

BLUE AREA – DRILLING

Answer the following questions before moving to the next area.

Check "yes" or "no."

1. Do you have three (3) holes in your buckle blank?

   yes____ no____

2. Have you removed all burrs from the holes drilled?

   yes____ no____

3. Did you use the buckle pattern to layout your holes?

   yes____ no____

4. Have you placed all tools and materials back in their proper labeled places?

   yes____ no____

Circle best answer.

5. Why did you use a punch to mark holes for drilling?

   a. so you could see the holes to be drilled
   b. so drill bit would start easier

6. After you have completed these questions have your instructor check your work.

7. If you have successfully completed these questions move to the next area, the Red Area.

8. If you need to do additional work return to Step 1 and start over.

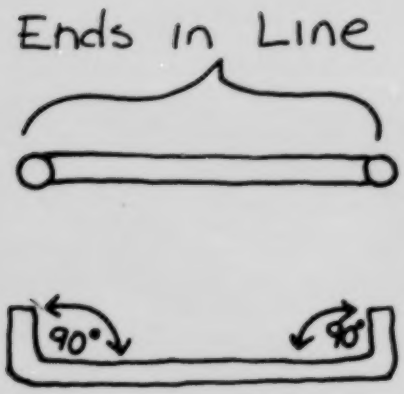
STUDENT CHECKLIST

RED AREA – BENDING

Answer the following questions before moving to the next area.

Check "yes" or "no."

1. Does your filler rod now have this shape?



yes___ no___

2. Are the ends bent in line with one another?

yes___ no___

3. If you have answered these questions, have your instructor check your work.
4. If you have successfully completed this checklist, move to the Green Area.
5. If you need to do additional work return to Step 1 and start over.

STUDENT CHECKLIST

GREEN AREA – ASSEMBLY

Answer the following questions before moving to the next area.

Circle "yes" or "no."

1. Is the distance at least 3/8 of an inch between the belt (filler rod) and buckle blank?

   yes____ no____

2. Did you use the wooden gauge to test it?

   yes____ no____

3. Does your belt holder fit snugly in your buckle blank?

   yes____ no____

4. If you have answered these questions, have your instructor check your work.
5. If you have successfully completed this checklist, move to the Brown Area.
6. If you need to do more work return to Step 1 and start over.

STUDENT CHECKLIST

BROWN AREA – WELDING

Answer the following questions before moving to the next area.

Check "yes" or "no."

1. Did the buckle blank melt the filler rod?

   yes____ no____

2. Did the filler rod melt and flow over the buckle blank?

   yes____ no____

3. Can you wear regular safety glasses (clear lenses) while using the oxygen-acetylene welding outfit?

   yes____ no____

Circle best answer.

4. What is the proper pressure to set on the acetylene gauge before welding?

   a. 10 psi
   b. 5 psi
   c. 11 psi
   d. 8 psi

5. Where is the hottest part of the flame?

   a. at the end of the blue tip
   b. about 2" (5.08 cm) from blue tip
   c. about 1" (2.54 cm) from blue tip

6. If your flame goes out while you are setting it up for welding or in the process of welding, what should you do?

   a. run
   b. turn acetylene valve off at torch, then turn oxygen valve off
   c. yell for help
   d. turn acetylene valve off at tank

7. When you leave the oxygen-acetylene tanks, should the thumbscrews located on the regulators be loose or tight?

   loose____ tight____

Checklist – Brown Area – Welding (cont'd.)

8. Is your buckle cool?

   yes____ no____

9. After you have completed these questions, have your instructor check your work.

10. If you have successfully completed this checklist, move to the Purple Area.

11. If additional work is needed return to Step 1 and start over.

STUDENT CHECKLIST

PURPLE AREA – FINISHING

Answer the following questions.

Check "yes" or " no."

1. Did you smooth the end of the belt hook with a draw file?

   yes____ no____

2. Did you use a wire brush and paint thinner to clean your buckle?

   yes____ no____

3. Has your buckle dried?

   yes____ no____

Circle best answer.

4. Why do you bend the belt hook with a pair of pliers?

   a. so it will look more like a belt buckle
   b. so the hook will stay in your belt

5. After you have completed these questions, have your instructor check your work.

6. If you have successfully completed this checklist, sign your name on the cover page of this booklet, and turn it over to your instructor.

7. If additional work is required, return to Step 1 of the Purple Area and start over.

BLACK AREA

1. SAW OR CUT THROUGH METAL CAREFULLY

- DO NOT SLIP AND CUT HANDS ON SHARP EDGES OF METAL.

YELLOW AREA

1. CARE SHOULD BE TAKEN WHEN FILING EDGES

- BAD CUTS COULD OCCUR.

BLUE AREA

1. SAFETY GLASSES MUST BE WORN WHEN DRILLING METAL.
2. CARE SHOULD BE TAKEN NOT TO POP THROUGH METAL WHEN DRILLING - BREAKING DRILL BIT.

BROWN AREA

1. FITTINGS MUST BE TIGHT TO PREVENT ANY LEAKS.

2. OPEN ACETYLENE TANK ON 1/4 OF A TURN.

3. OPEN OXYGEN TANK ALL THE WAY.

4. DO NOT EXEED 5 P.S.I. OF WORKING PRESSURE ON ACETYLENE GAUGE WHEN SETTING UP OUTFIT.

BROWN AREA

5. SAFETY GLASSES -GOGGLES-, GLOVES, AND APRONS MUST BE WORN WHILE WELDING.

6. ALWAYS HOLD TORCH AWAY FROM PEOPLE AND TANKS WHEN LIGHTING.

7. ALWAYS USE STRIKERS TO LIGHT TORCH - NOT A MATCH OR LIGHTER.

BROWN AREA

8. IF POPPING OCCURS PULL FLAME AWAY FROM METAL AND ALLOW METAL TO COOL SOMEWHAT.

9. BEWARE OF HOT METAL. WHILE APPEARING COOL, METAL MAY STILL BE VERY HOT.

10. HANDLE HOT WORK ONLY WITH PLIERS PROVIDED.

PURPLE AREA

1. PAINT THINNER SHOULD BE KEPT IN METAL CONTAINER.

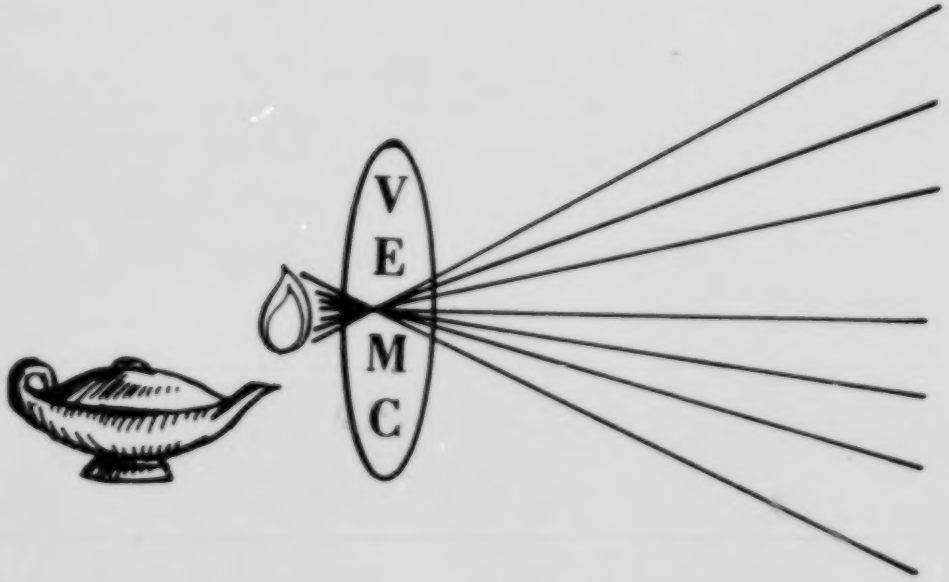
2. IF THINNER GETS IN EYES OR IRRITATES SKIN, FLUSH IMMEDIATLY WITH WATER.

28

3. KEEP SPRAY PAINT OR FINISH AWAY FROM OPEN FLAMES. CONTACT AND INFORM INSTRUCTOR.

PURPLE AREA

4. SPRAY FINISH IN WELL VENTILATED AREA.
   FUMES ARE HARMFUL TO BREATHE.
   EX. BY OPEN WINDOWS



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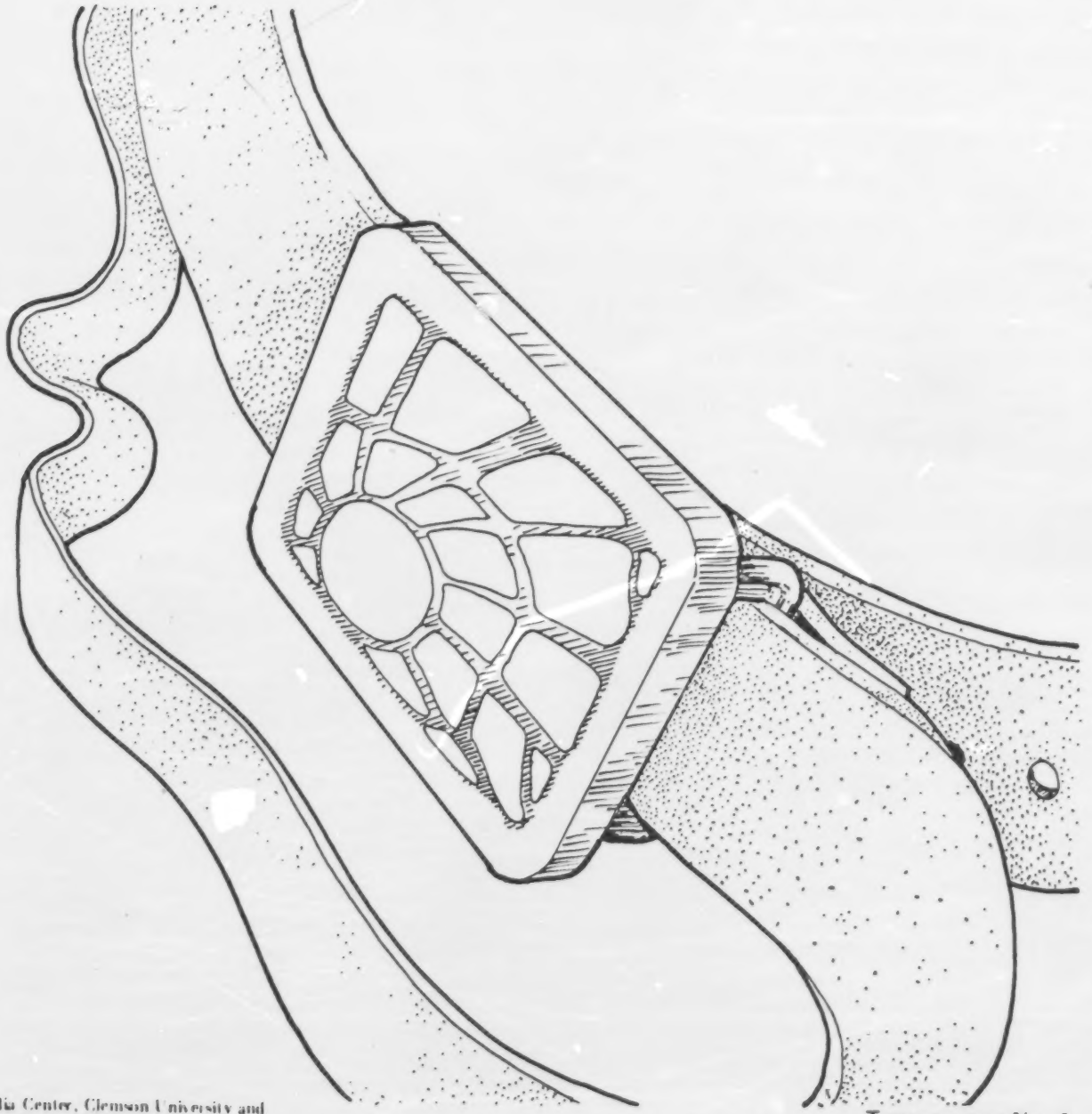

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Transparency No. 1

BASIC PROCESSES OF:

CUTTING & SHAPING

DRILLING

& BENDING & WELDING &

FINISHING → END PRODUCT

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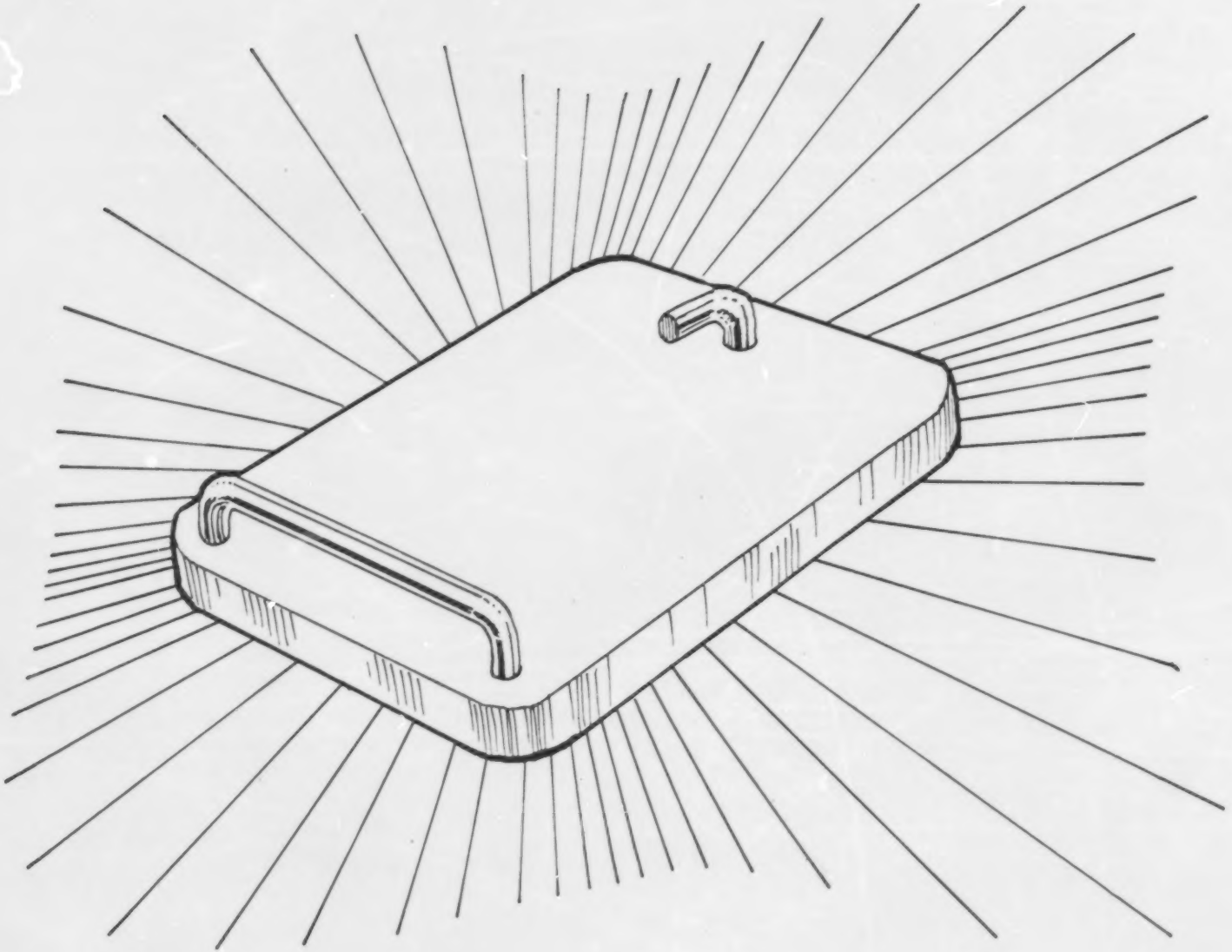
Transparency No. 2



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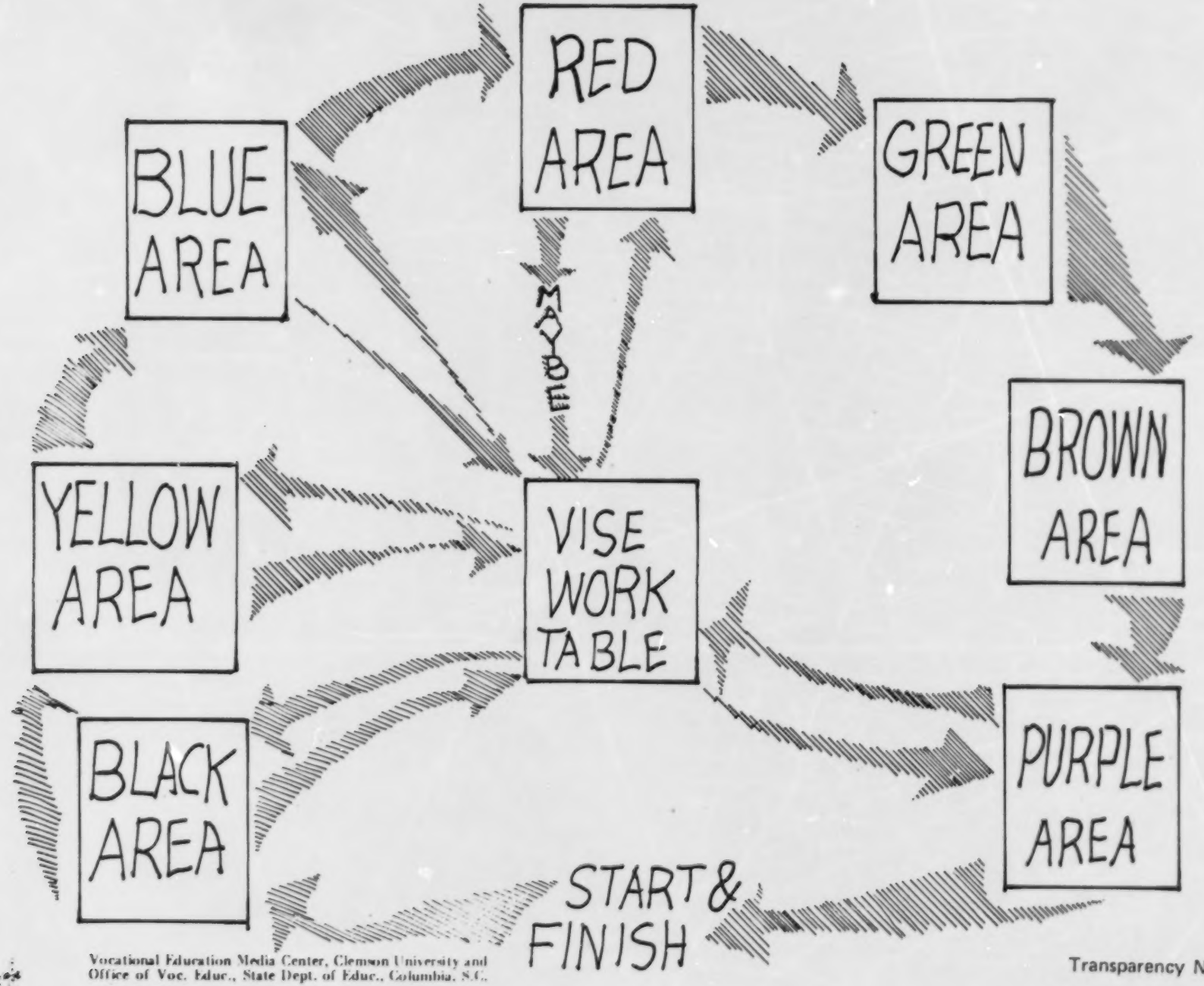

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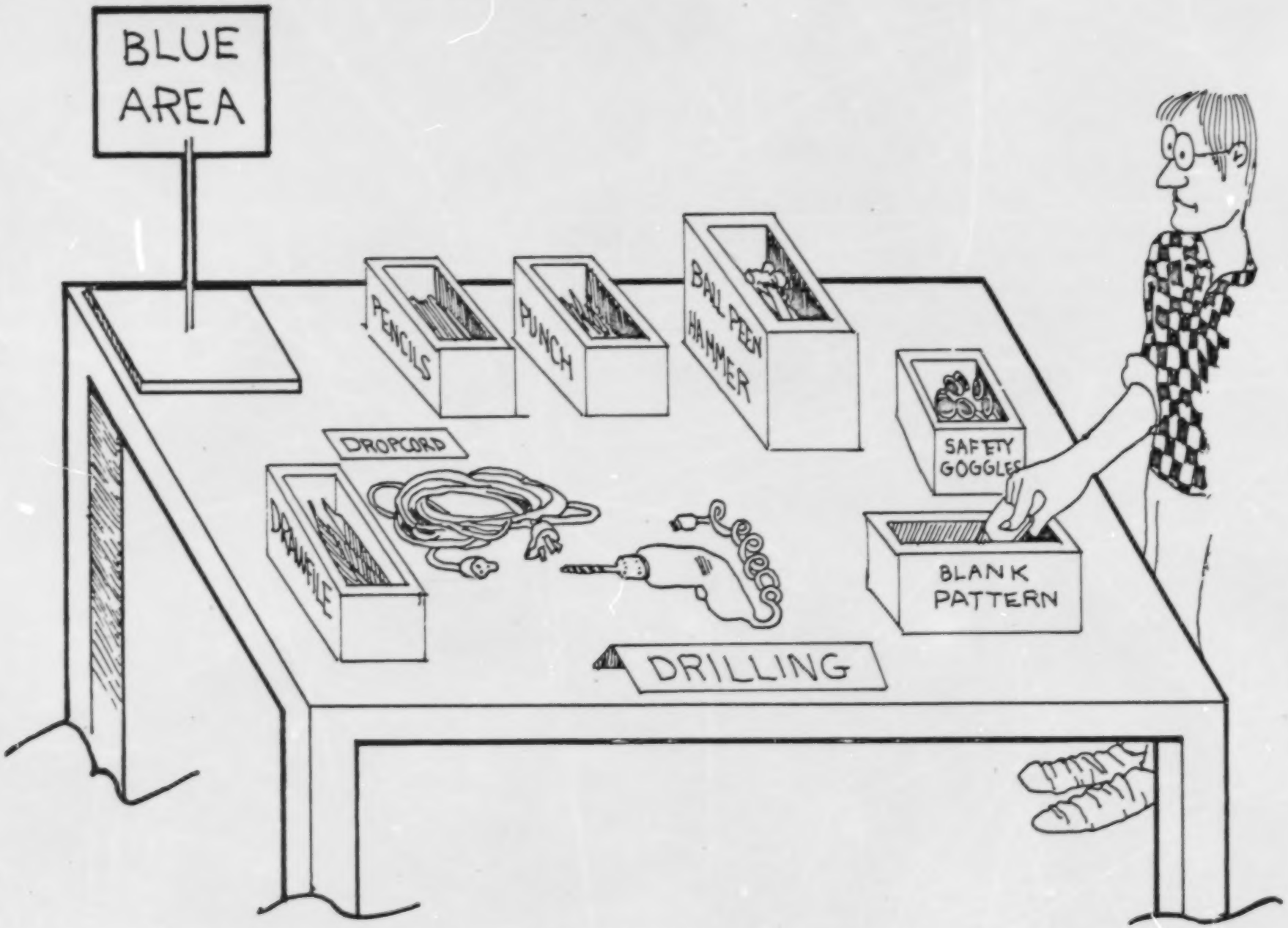

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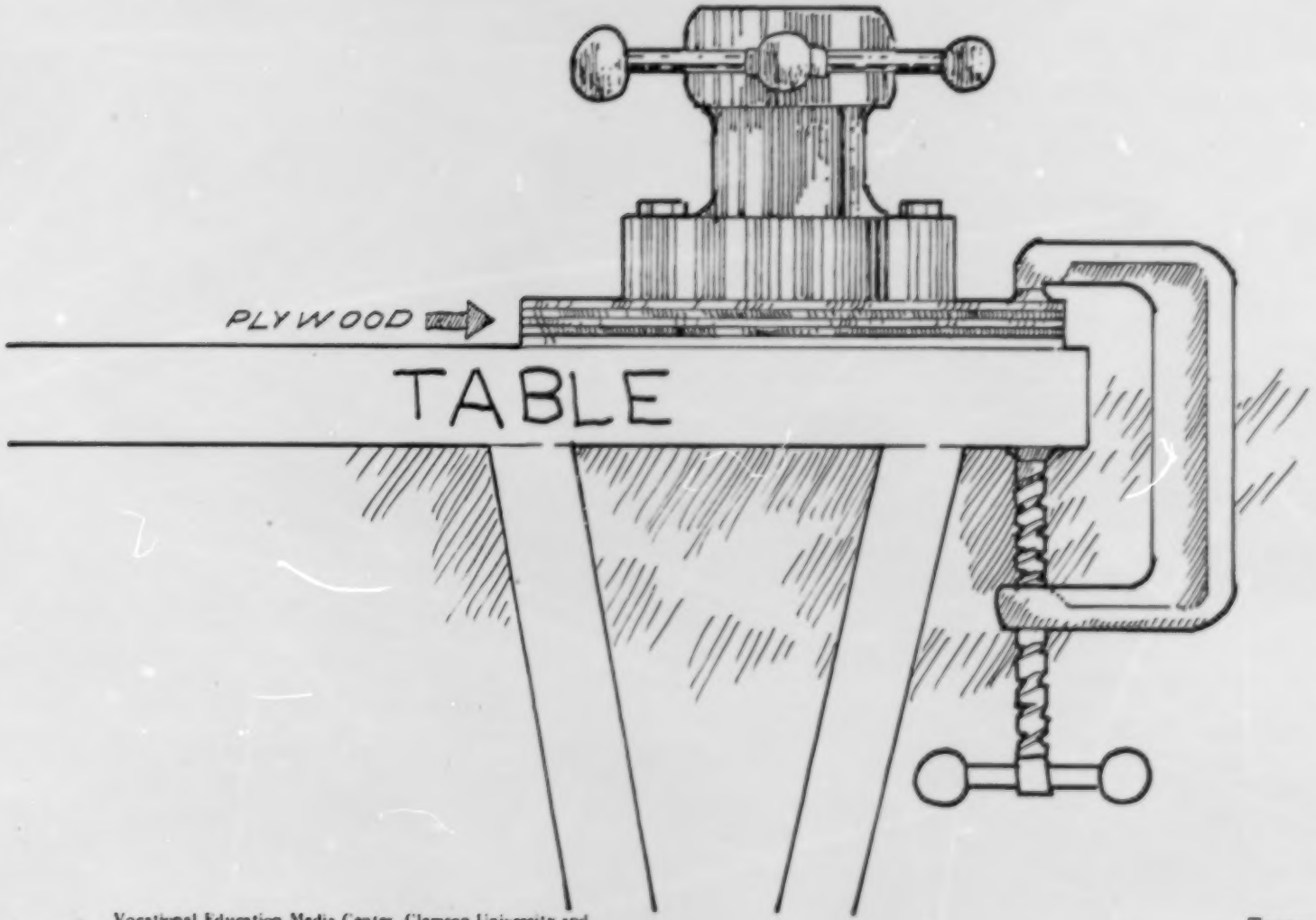
Transparency No. 5

VISE WORK TABLE



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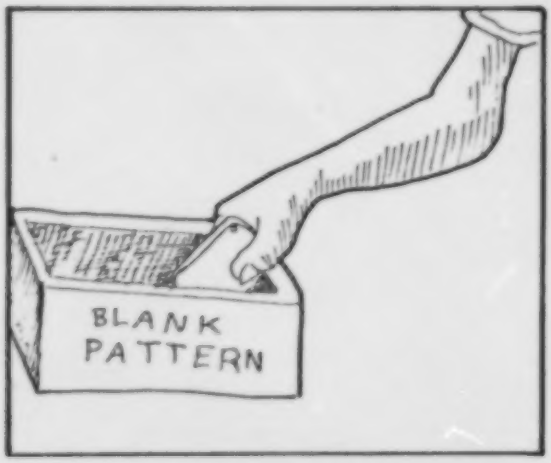
Transparency No 6

5.L

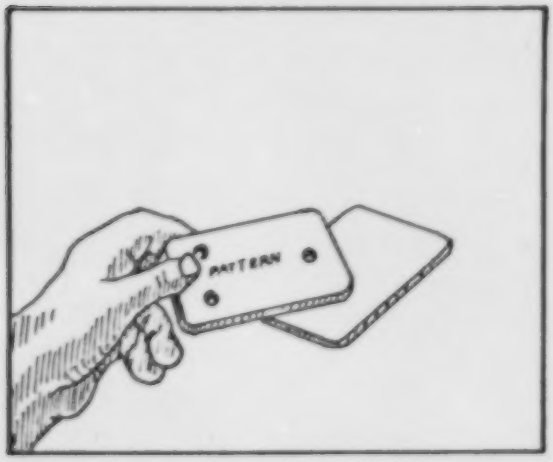
Instructional Objective III

BLUE AREA – DRILLING

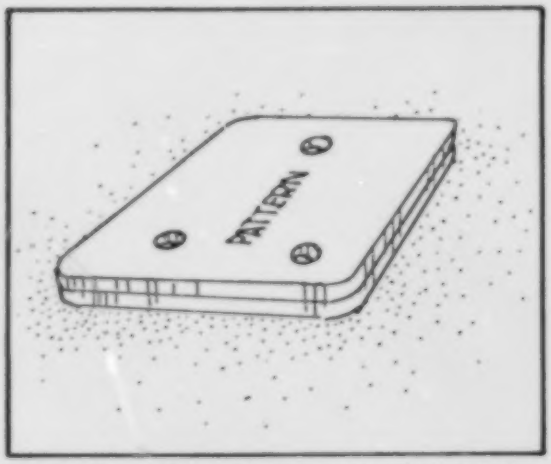
Given the proper tools and equipment each student will locate and drill three (3) holes.



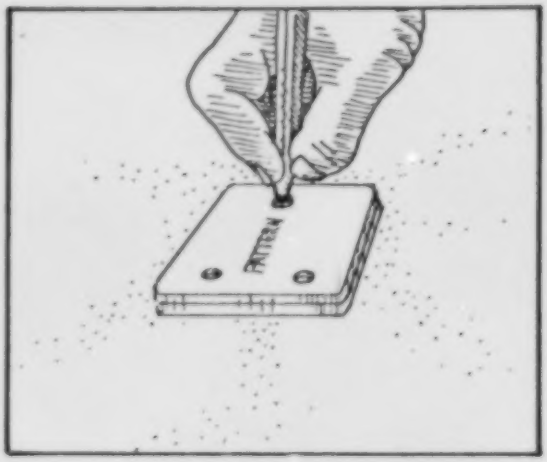
STEP 1 – Move to the Blue Area and obtain a blank pattern.



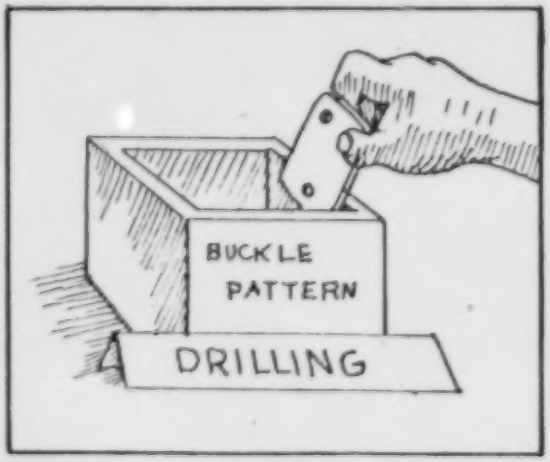
STEP 2 – Position the pattern on top of your belt buckle blank.



STEP 3 – Even all four (4) sides of the pattern with the belt buckle.



STEP 4 – Using a pencil, mark the holes to be drilled.



STEP 5 – Return the pattern to the appropriate area on the Blue Area table.

Transparency No. 7

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Transparency No. 8

STUDENT CHECKLIST

BLUE AREA – DRILLING

Answer the following questions before moving to the next area.

Check "yes" or "no."

1. Do you have three (3) holes in your buckle blank?

   yes___ no___

2. Have you removed all burrs from the holes drilled?

   yes___ no___

3. Did you use the buckle pattern to layout your holes?

   yes___ no___

4. Have you placed all tools and materials back in their proper labeled places?

   yes___ no___

Circle best answer.

5. Why did you use a punch to mark holes for drilling?

   a. so you could see the holes to be drilled
   b. so drill bit would start easier

6. After you have completed these questions have your instructor check your work.

7. If you have successfully completed these questions move to the next area, the Red Area.

8. If you need to do additional work return to Step 1 and start over.

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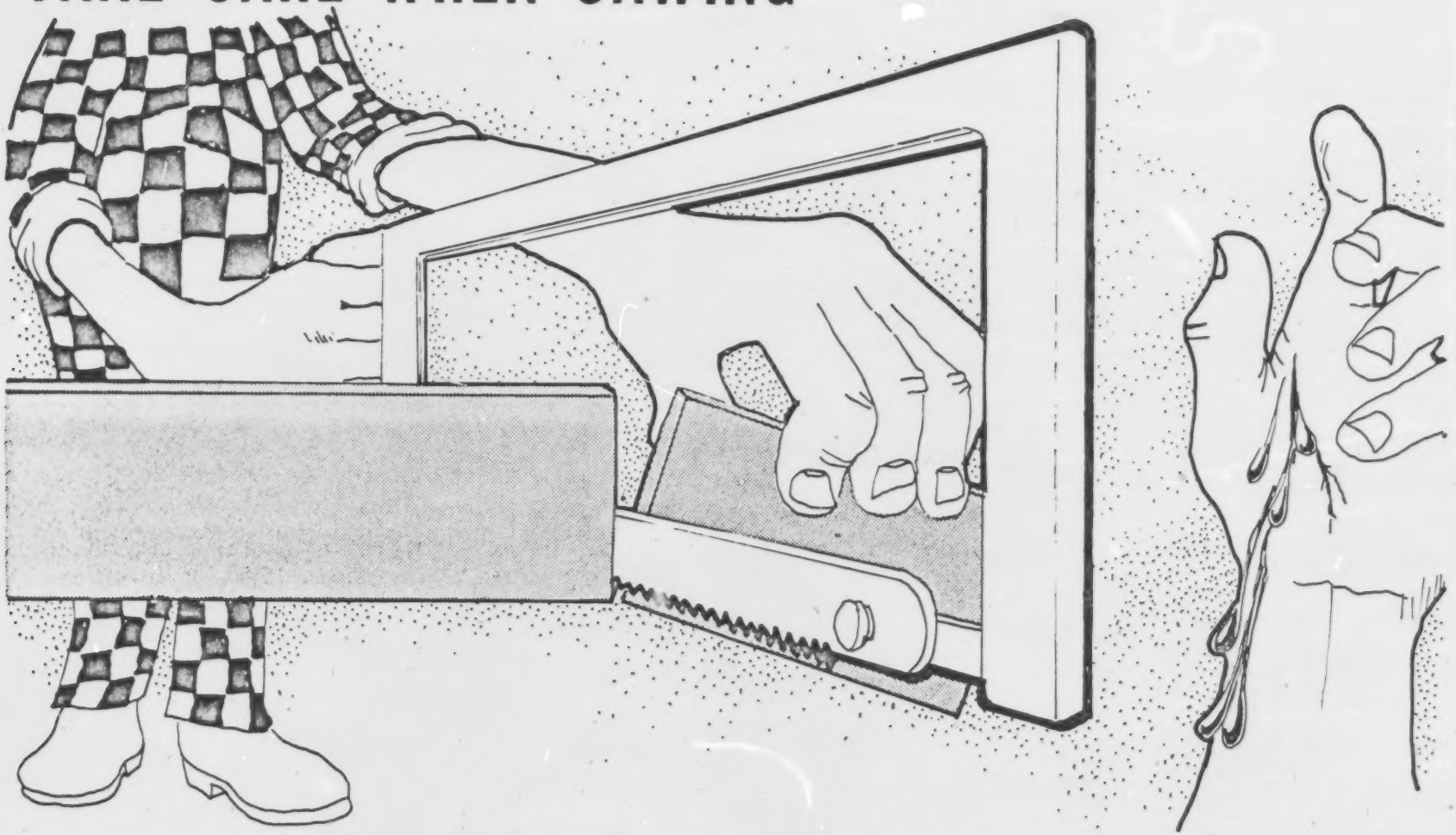
BLACK AREA

TAKE CARE WHEN SAWING



THE EDGES WILL CUT

Transparency No. 9

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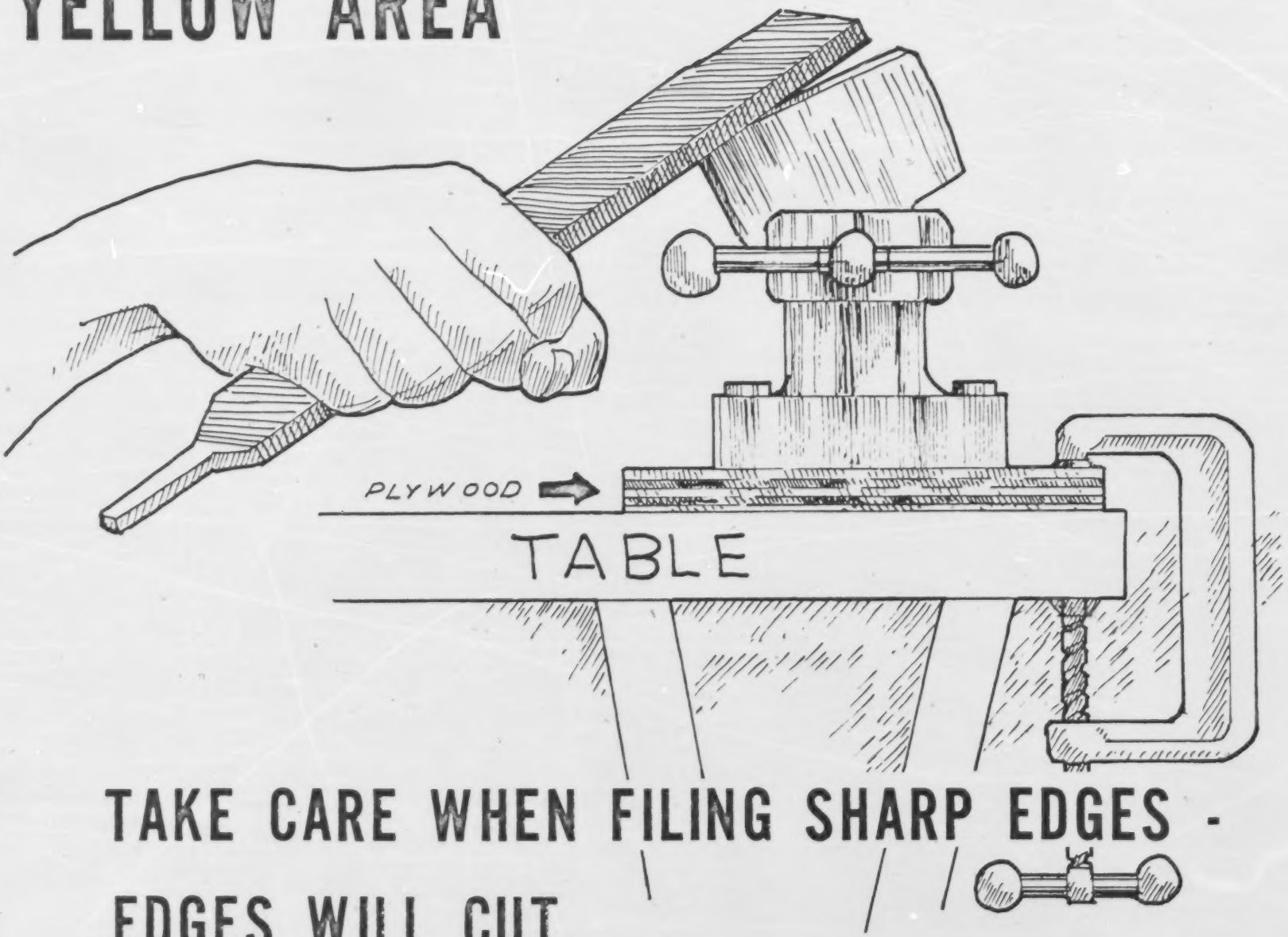
YELLOW AREA



TAKE CARE WHEN FILING SHARP EDGES - EDGES WILL CUT.

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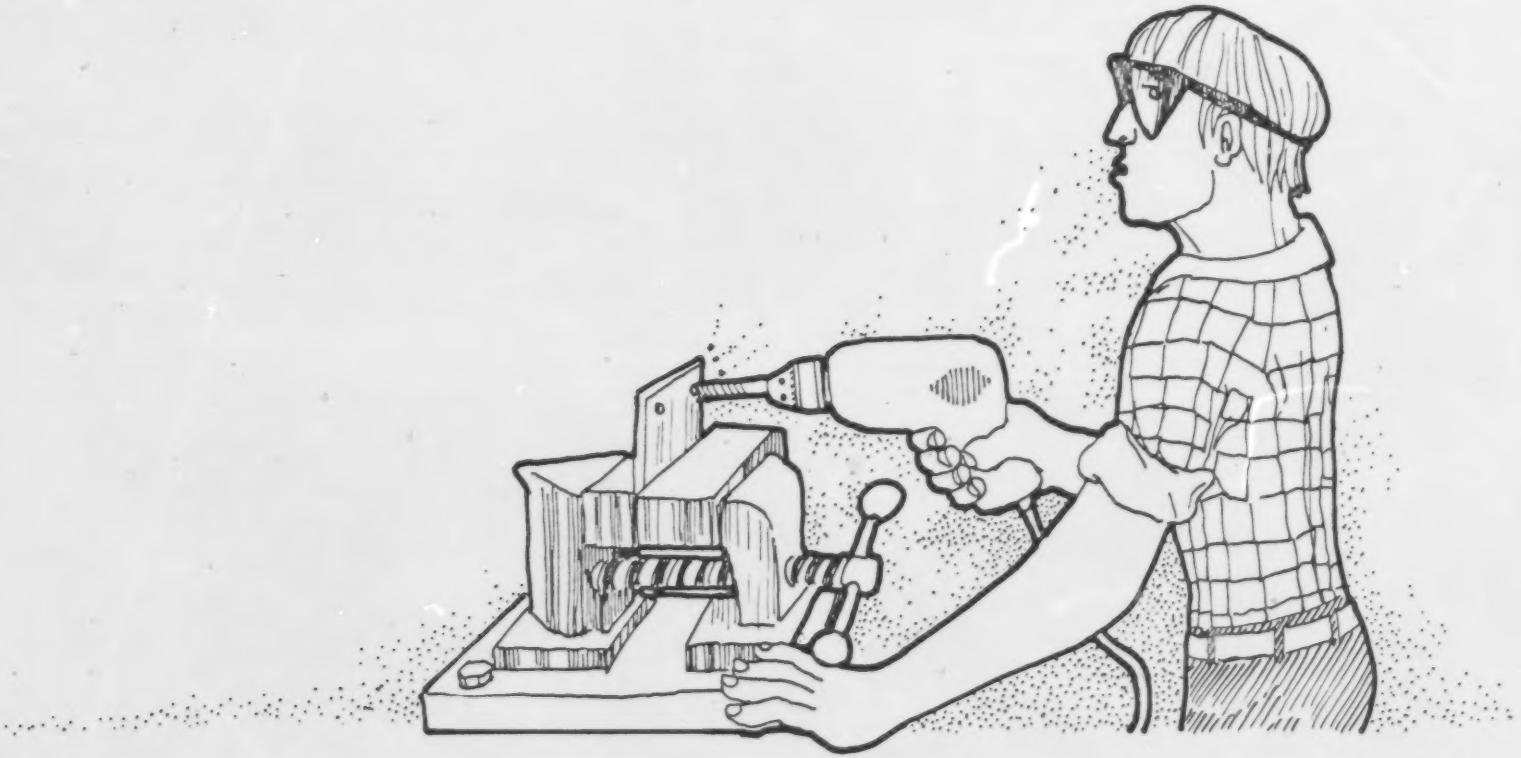
Transparency No. 10

BLUE AREA



1. WEAR SAFETY GLASSES WHEN DRILLING.

2. BE CAREFUL NOT TO BREAK THE BIT.

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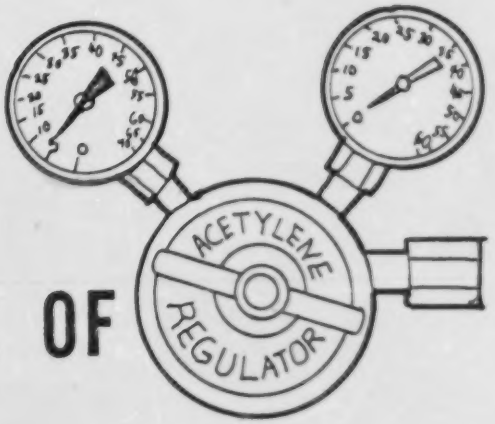
Transparency No. 11

BROWN AREA

1. SAFETY GOGGLES, GLOVES AND APRONS MUST BE WORN.



2. DO NOT EXCEED 5 P.S.I. OF WORKING PRESSURE.

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61

60

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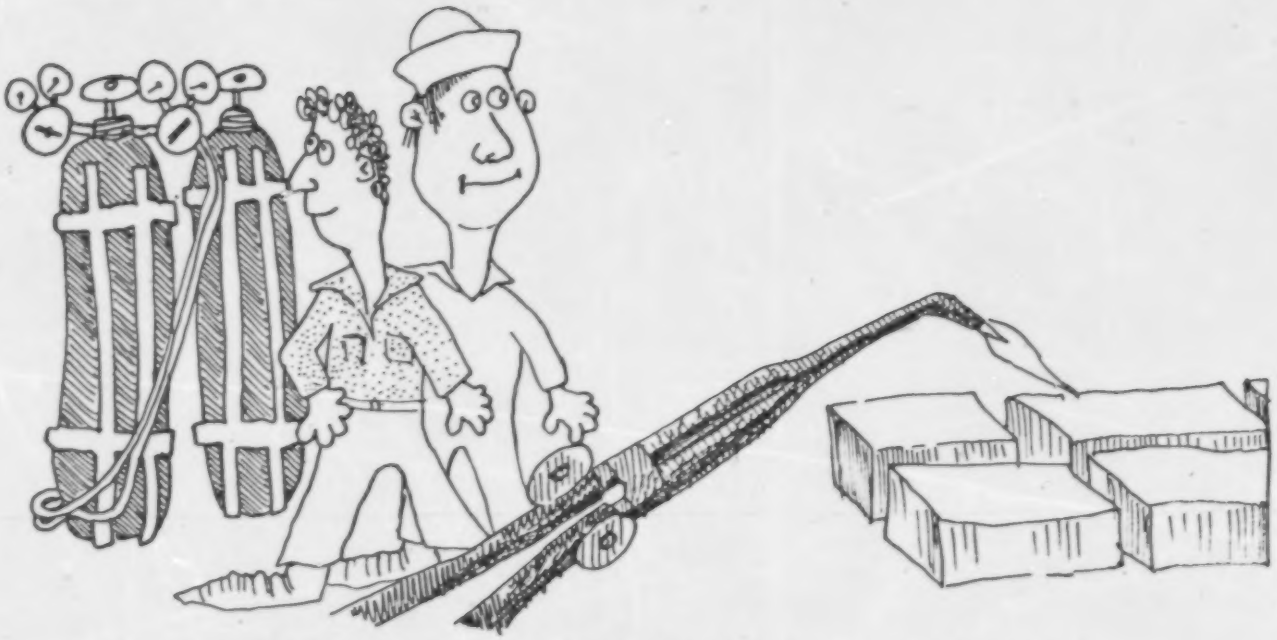
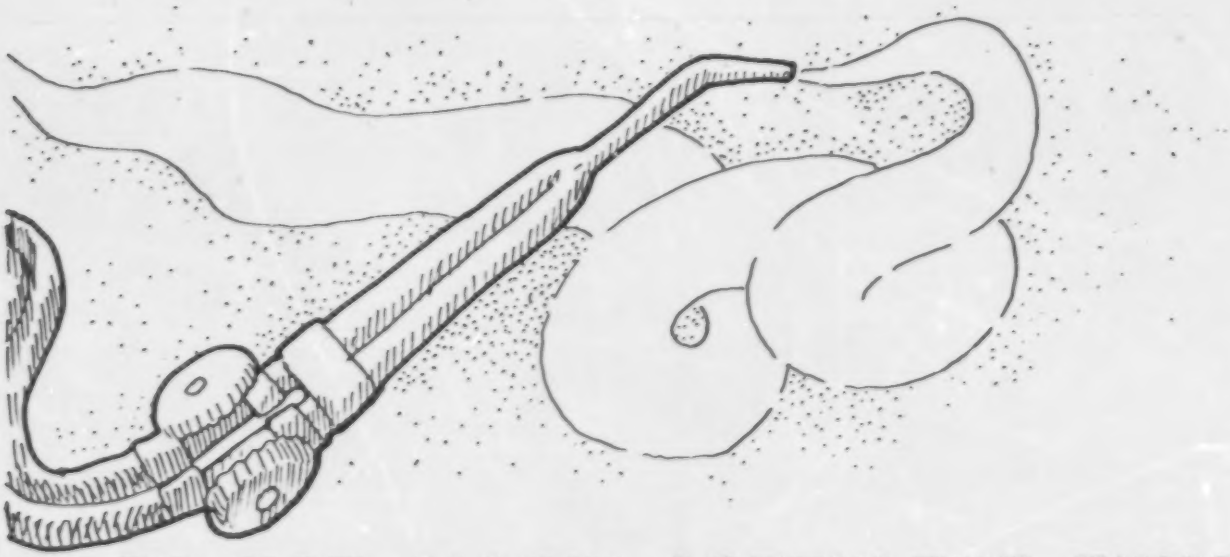


3. HOLD TORCH DOWN AND AWAY FROM PEOPLE AND TANKS



4. DO NOT ALLOW ACETYLENE FUMES TO FLOW FREE.

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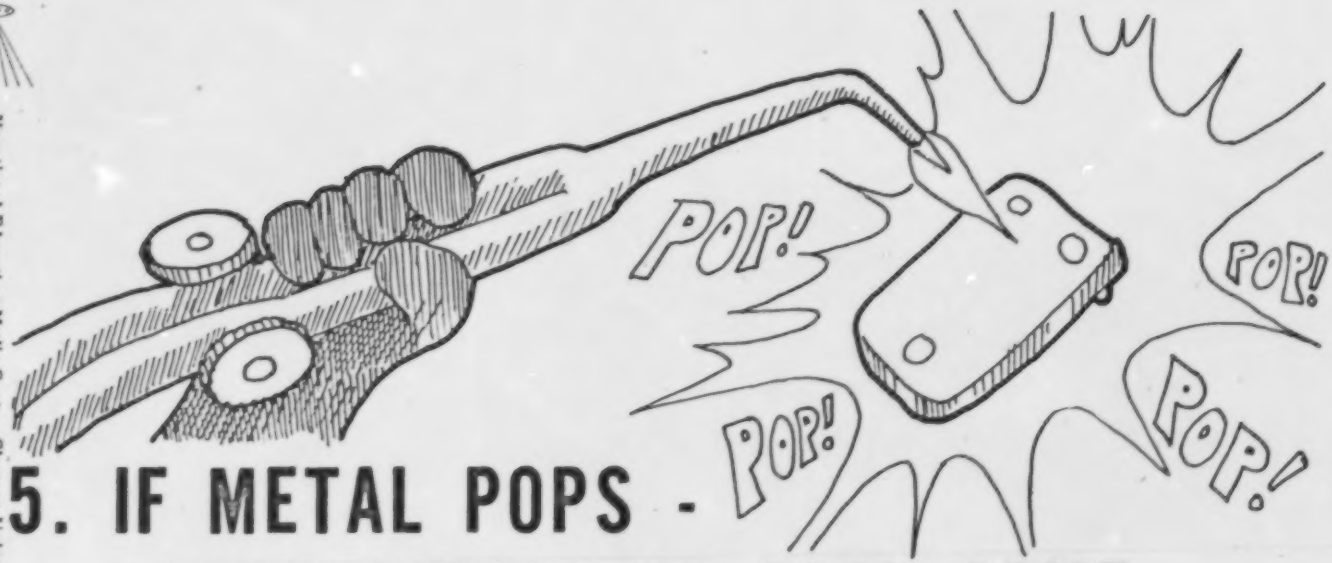
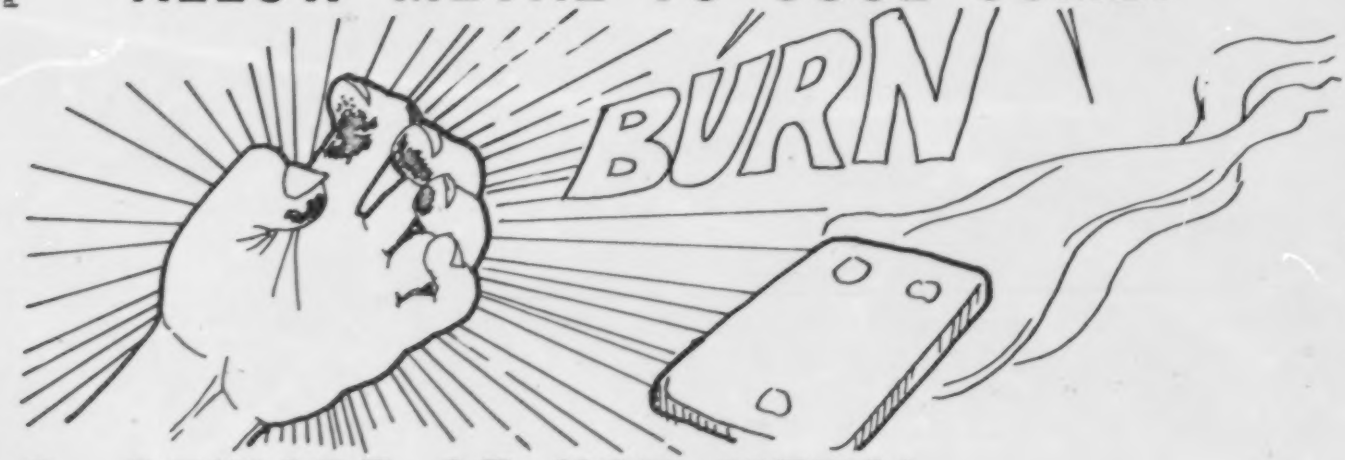
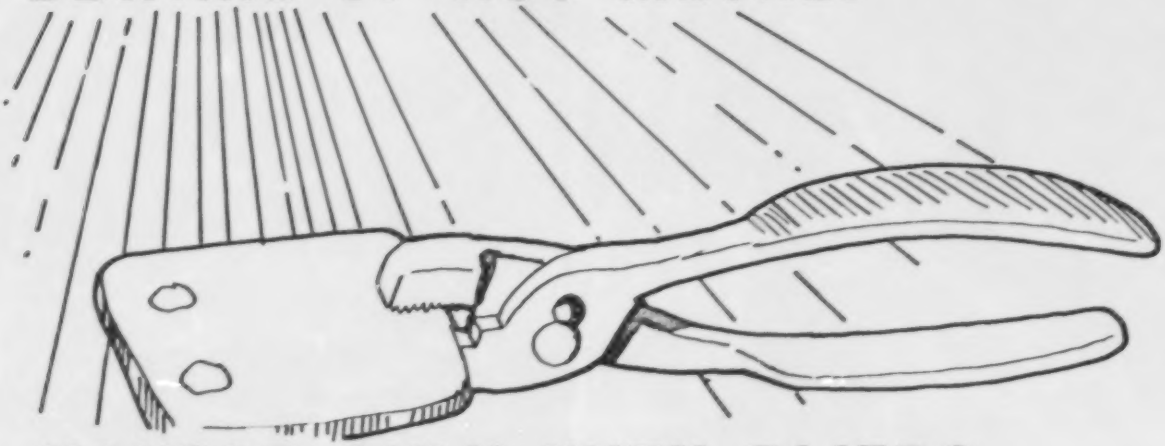


5. IF METAL POPS - ALLOW METAL TO COOL SOME.



6. BEWARE OF HOT METAL.



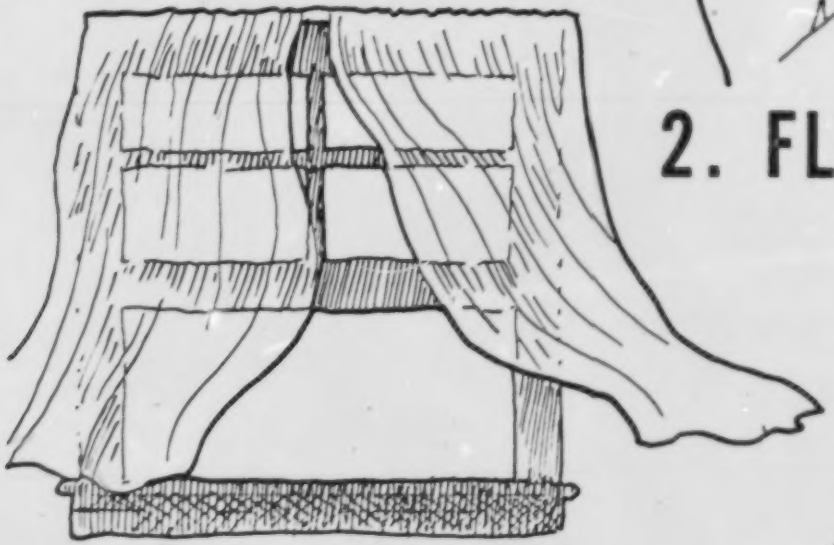
7. HANDLE ONLY WITH PLIERS.

Transparency No. 14

PURPLE AREA

1. PAINT THINNER

2. FLUSH EYES WITH WATER.



3. SPRAY FINISH IN WELL VENTILATED AREA.

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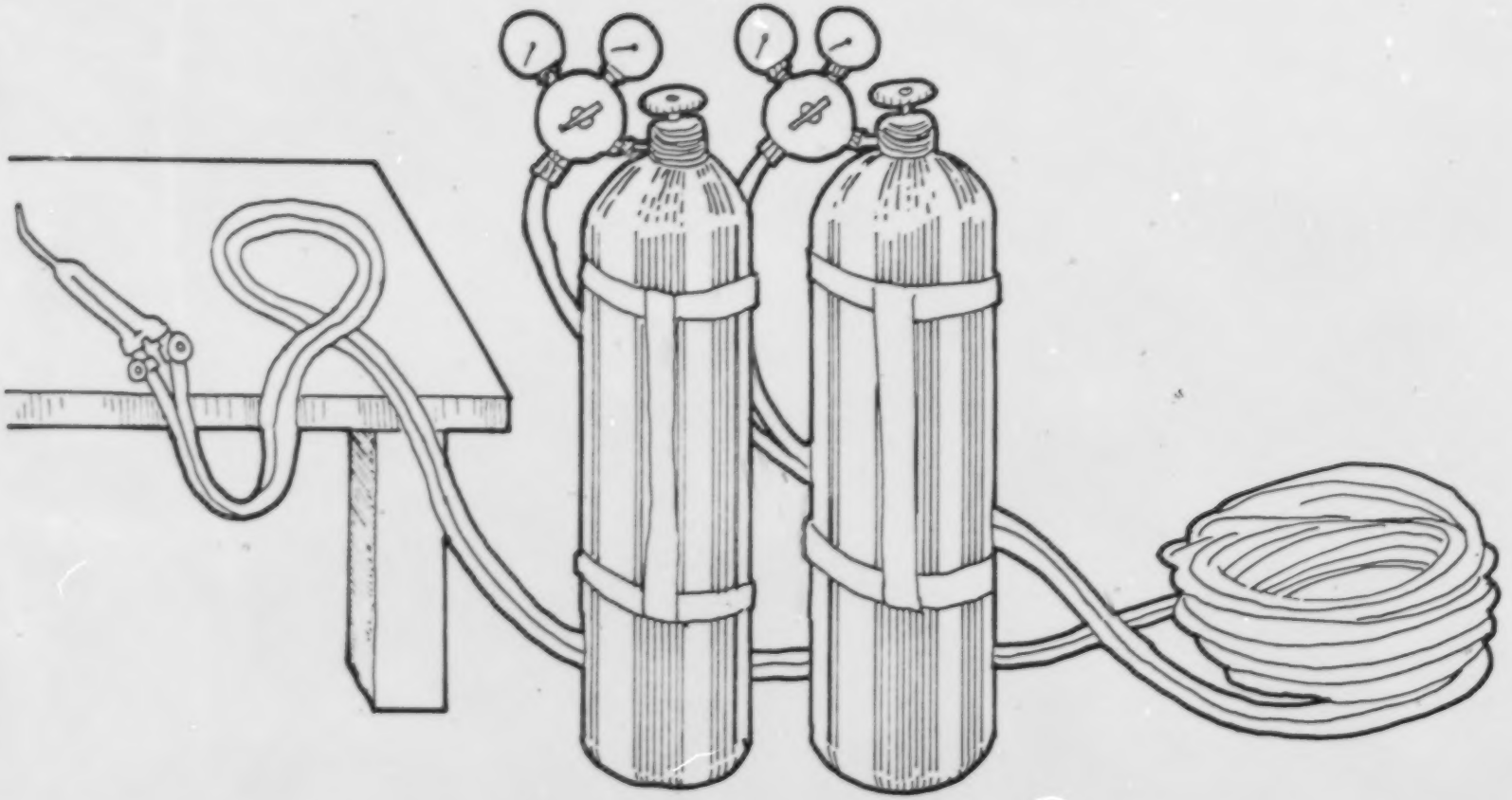
Transparency No. 15

64



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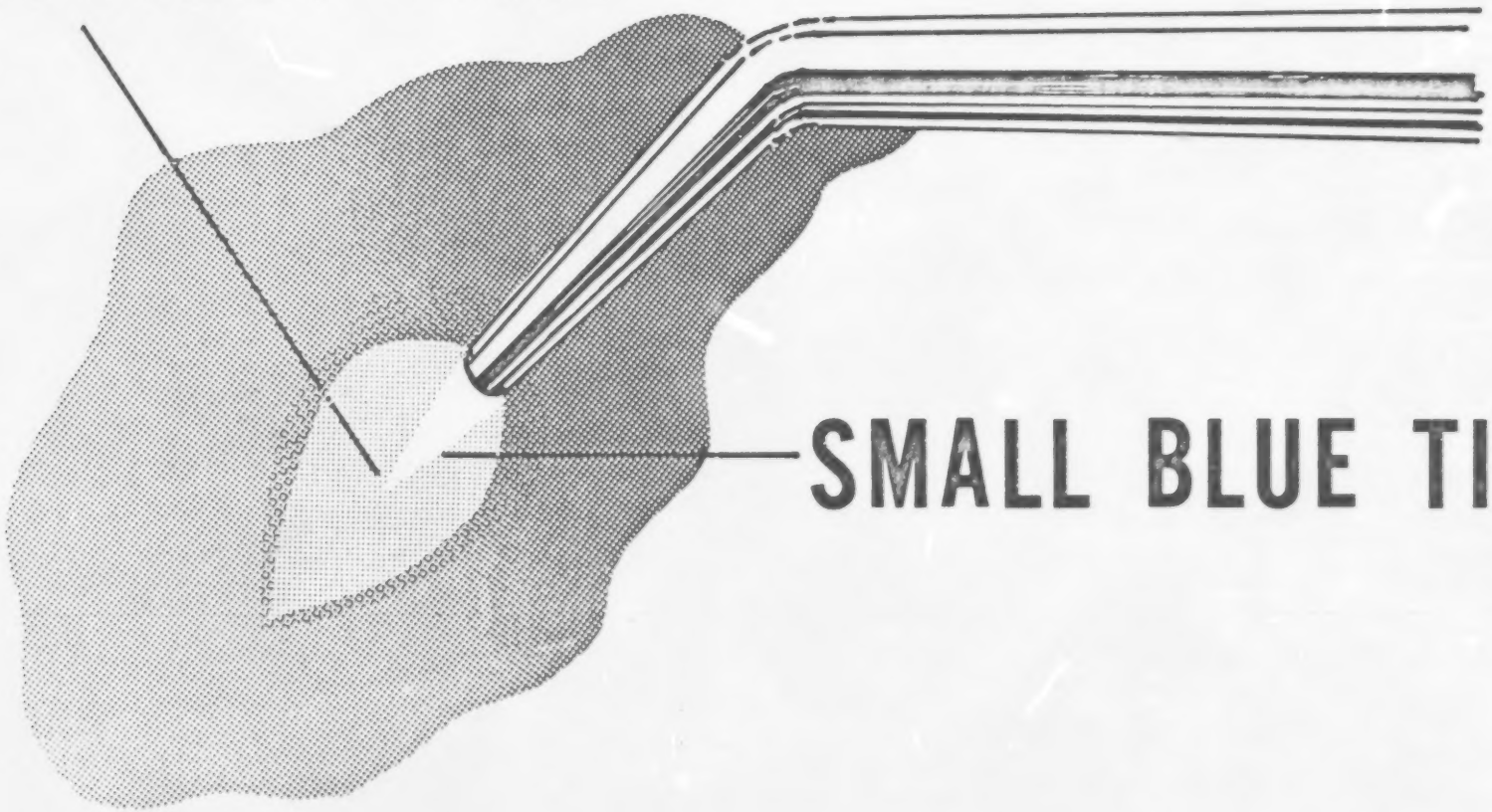
Transparency No. 16

66

HOTTEST PART



SMALL BLUE TIP

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Transparency No. 17

T & I – GAS WELDING

Kit No. 68

INDEX OF TRANSPARENCIES

Identification	Number
Finished Product	1
Basic Processes Involved in Working With Metal	2
End Product	3
Flow Chart	4
Tools and Equipment	5
Vise Work Table	6
Drilling – Step-by-Step Instructions	7
Blue Area Checklist	8
Safety Rules	
Black Area	9
Yellow Area	10
Blue Area	11
Brown Area	12–14
Purple Area	15
Proper Setup of Oxygen-Acetylene Welding Outfit	16
Neutral Flame	17

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1. The transparencies have been dusted during the printing process. This dust may be washed off with a damp, soft cloth. Use water only. The dust can cause unsightly shadows on your projector. Dry the transparencies gently with a cloth, paper towel, or by spreading them out on a table until dry.

2. Please do not write on the transparency with a grease or wax pencil. If you wish to emphasize something, place a clear sheet of plastic over the transparency and write on the clear sheet. This will prevent possible abrasion to the transparency.

3. Store this folder in a good filing cabinet. If you wish to mount them you may. Overlays should be hinged together to start with.

4. Store in a dry place.

5. Yes, the plastic will bend, tear and scratch – if you let it be abused. Cared for properly, it will last for many years.

6. To separate the transparency from the slip sheet, grasp the transparency in one hand and the slip sheet in the other, near the glue strip, and carefully pull the two apart.

T&I – GAS WELDING

Kit No. 68

STUDENT
LEARNING ACTIVITY GUIDE

Prepared by

Frank Lanford
Seneca High School
Seneca, South Carolina 29678

State Department of Education
Office of Vocational Education
Prevocational Education
Columbia, South Carolina 29201

In Cooperation With

Vocational Education Media Center
Clemson University
Clemson, South Carolina 29631

1978

GAS WELDING

INTRODUCTION

This activity introduces a student to the gas weld area through the production of a metal belt buckle. Following the step-by-step guide provided, you will be introduced to several areas of metal fabrication. You will be exposed to some of the basic principles of metal working. These areas include cutting, drilling, bending, welding (joining), and finishing. This activity is basic in context, but special precautions must be taken at the welding area to eliminate any accidents.

GOALS

Each student will become familiar with cutting metal.

Each student will learn how to shape and deburr metal.

Each student will become familiar with drilling metal.

Each student will learn how to bend metal.

Each student will learn how to weld (join) metal together.

Each student will become familiar with finishing a metal product.

DIRECTIONS

This guide is designed for use as a step-by-step instructional package for 9th and 10th grade students. A general group meeting between the instructor and the class will begin the activity. During this meeting the instructor will cover the safety rules you must follow.

Once you begin the programmed text, you must follow all directions and successfully complete each step within the color area before moving to the next color area. Each color checklist must be completed and corrected by your instructor. All the tools and materials for the successful completion of each color area will be located within that area except the vises which are all located on one table in the center of your work area.

If questions arise during the operations ask your instructor for help.

MATERIAL

Obtain one Student Activity Checklist Booklet.

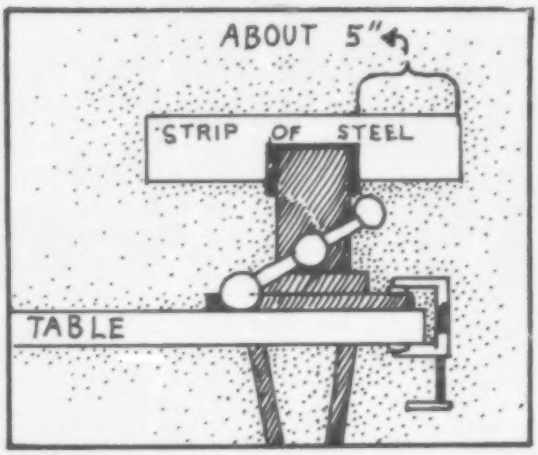
PROGRAMMED TEXT

BLACK AREA – CUTTING STOCK

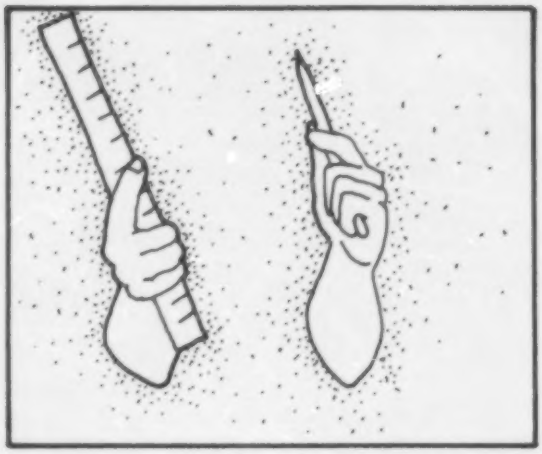
Instructional Objective 1

Given the necessary tools and equipment each student will cut one peice of steel (1/8" x 2 1/2" x 3 1/2") and two pieces of 1/8" filler rod.

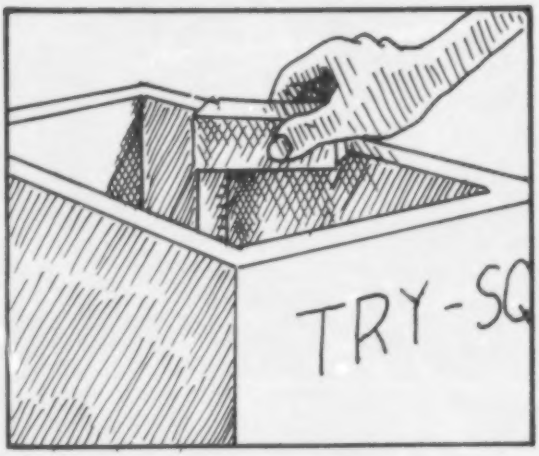
STEP 1 – Go to the Black Area and locate the strips of steel.



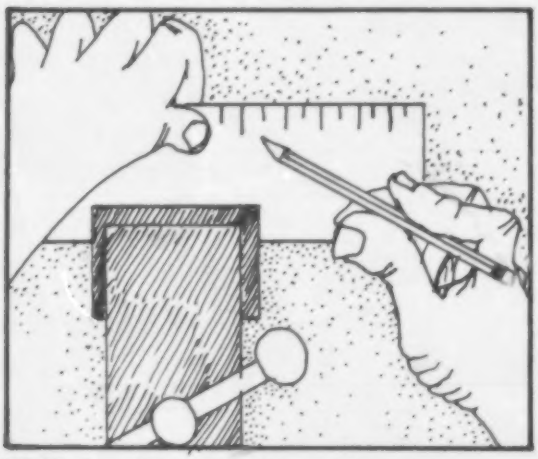
STEP 2 – Clamp one strip of steel in vise mounted on center table. NOTE: About 5" (12.7 cm) should be extending from one side of the vise.



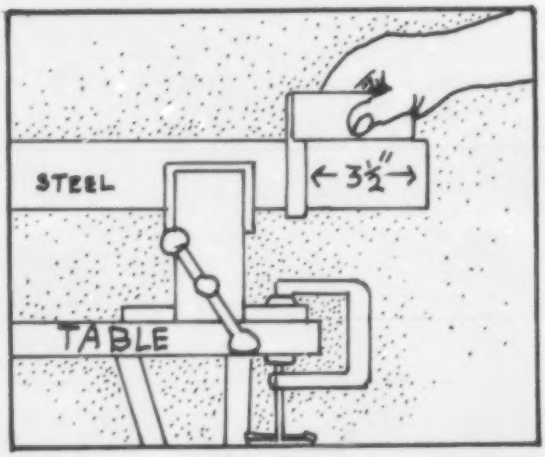
STEP 3 – Secure one 12" (30.48 cm) ruler and one piece of chalk from the Black Area.



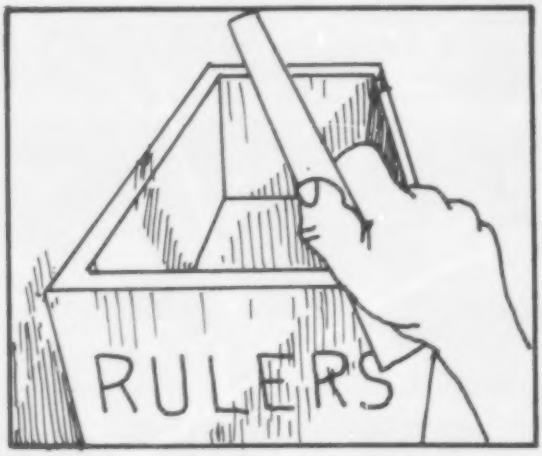
STEP 6 – Obtain one try square from box labeled "Try Squares."



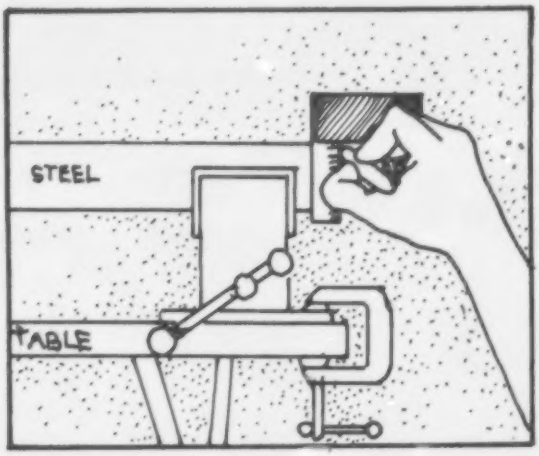
STEP 4 – Measure 3 1/2" (8.89 cm) from the end of the steel. Mark this point with the chalk.



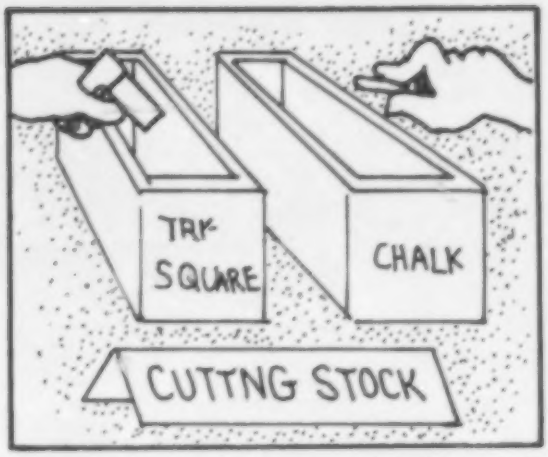
STEP 7 – Place try square along edge of steel even with the 3 1/2" (8.89 cm) mark.



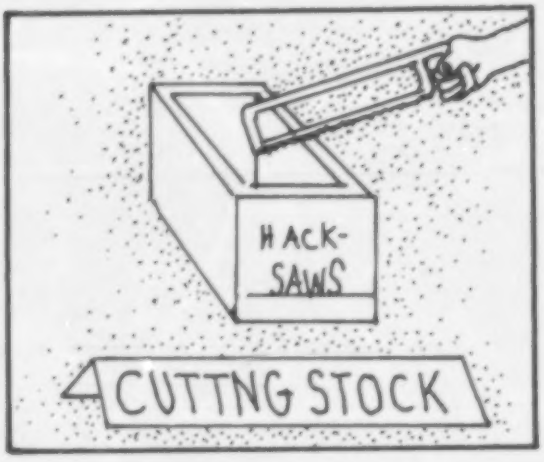
STEP 5 – Place ruler in box marked "Rulers."



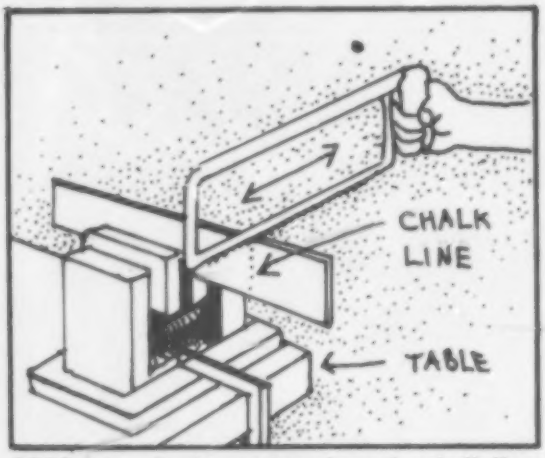
STEP 8 – Draw a line along edge of try square with chalk. You now have a line square with the adjacent side of the metal.



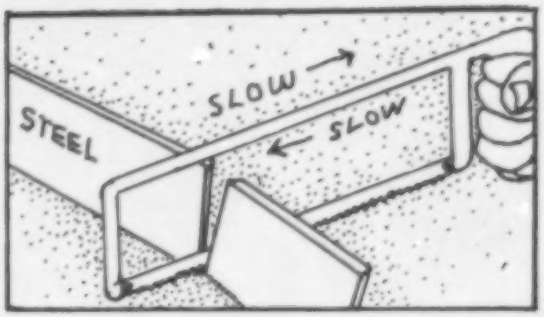
STEP 9 – Return try square and chalk to their proper boxes.



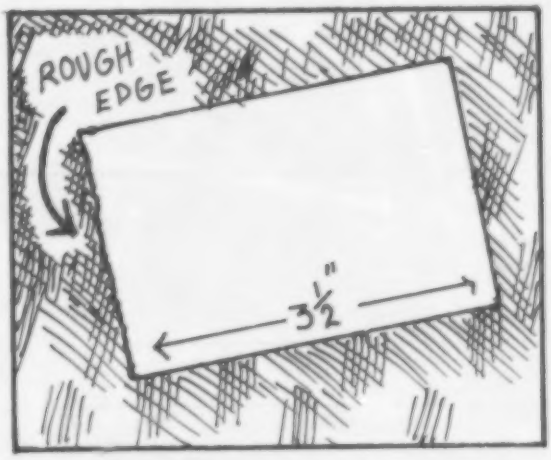
STEP 10 – Obtain one hacksaw from Black Area.



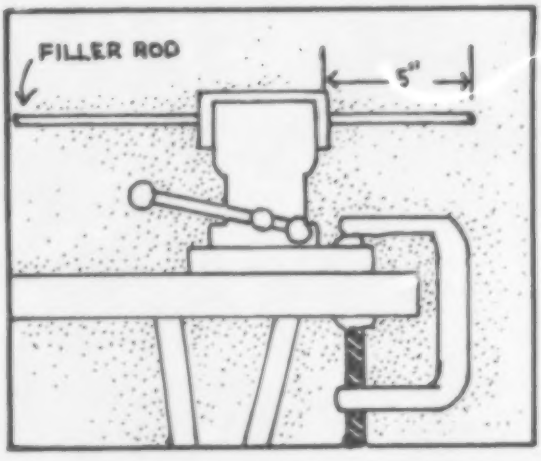
STEP 11 – Begin cutting along the chalk line with hacksaw. NOTE: Use slow and smooth strokes with hacksaw while cutting.



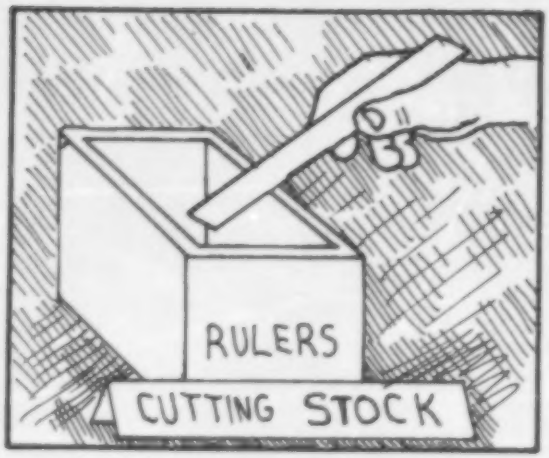
STEP 12 – As you approach the end of chalk line, slow the strokes and cut very carefully until you complete the cut. SAFETY NOTE: Be careful not to slip when cutting through material. Ends of material are very sharp and could give bad cuts.



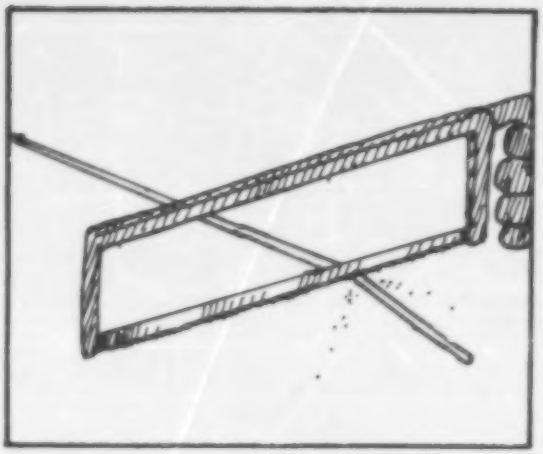
STEP 13 – The cut piece of metal should look like this.



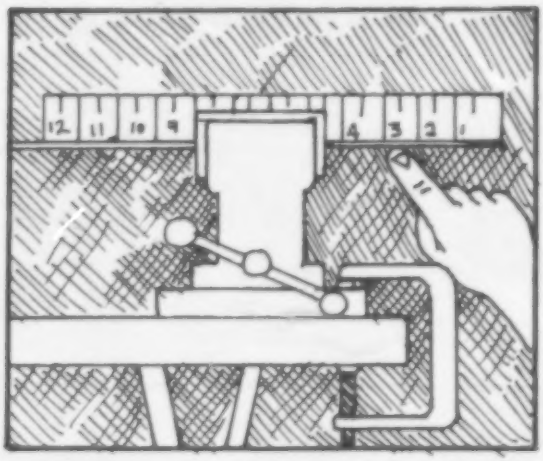
STEP 14 – Clamp one piece of 1/8" filler rod in vise with about 5" (12.7 cm) extending from one end.



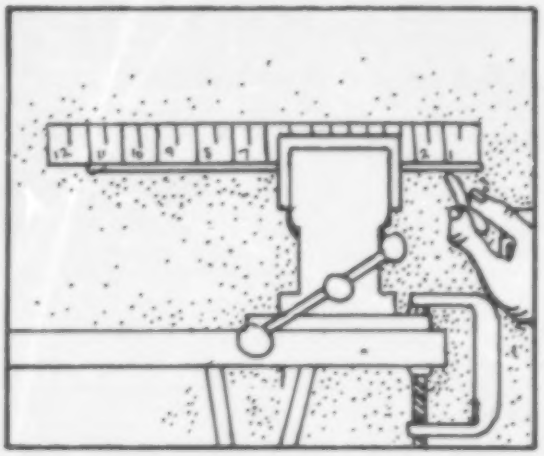
STEP 15 – Obtain one ruler and one piece of chalk.



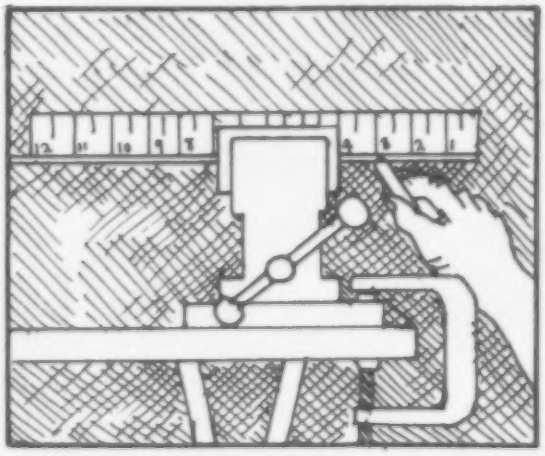
STEP 18 – Using the hacksaw cut the 3" (7.62 cm) piece of filler rod.



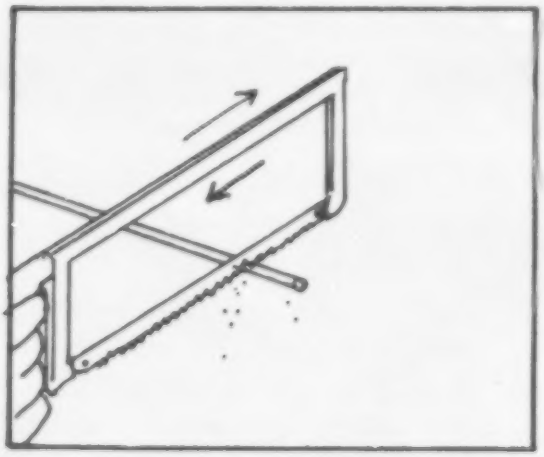
STEP 16 – Using the ruler measure 3" (7.6 2 cm) from one end of the rod.



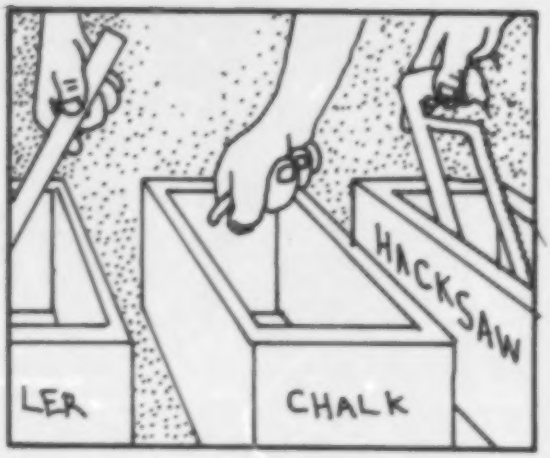
STEP 19 – Measure and mark 1" (2.54 cm) from end of the filler rod.



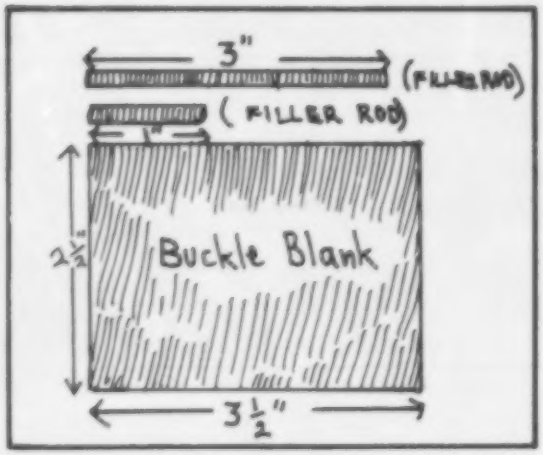
STEP 17 – Mark the 3" (7.62 cm) measurement using the piece of chalk.



STEP 20 – Using a hacksaw cut the 1" piece of filler rod.



STEP 21 – Place ruler, chalk and hacksaw back in appropriate boxes.



STEP 22 – You should now have:

A. One piece of filler rod 3" (7.62 cm) long
B. One piece of filler rod 1" (2.54 cm) long
C. One belt buckle blank 3 1/ 2" (8.89 cm) long

Check Point

Answer the following questions on the Black Area checklist in your Checklist Booklet.

DO NOT WRITE IN THIS MANUAL.

Check "yes" or "no."

1. Have you cut 3 pieces of material?

   yes___ no ___

2. Have you placed all the tools back in their labeled boxes?

   yes___ no___

Circle best answer.

3. Why should you slow down cutting metal when you near completion?

   a. blade might break on hacksaw
   b. you could slip and cut your hand on edge of metal
   c. material becomes softer and easier to cut

After you have answered these questions, have your instructor check your work.

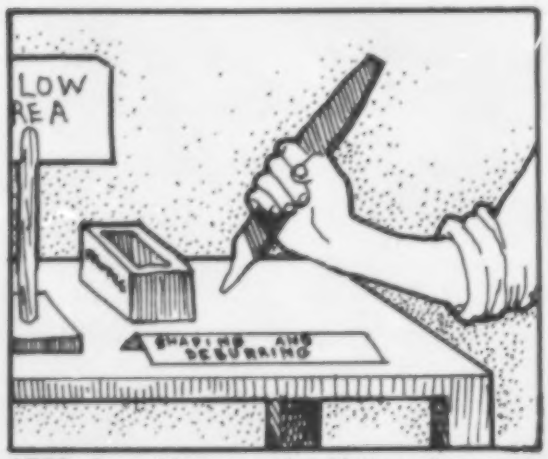
If you have successfully completed these questions, move to the Yellow Area.

If you need to do more work, return to Step 1 and start over

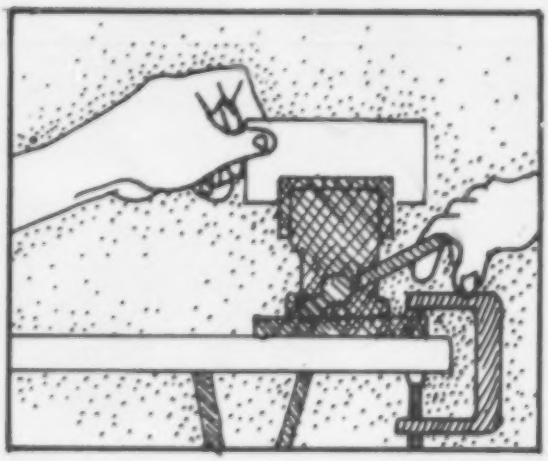
Instructional Objective II

YELLOW AREA – SHAPING AND DEBURRING

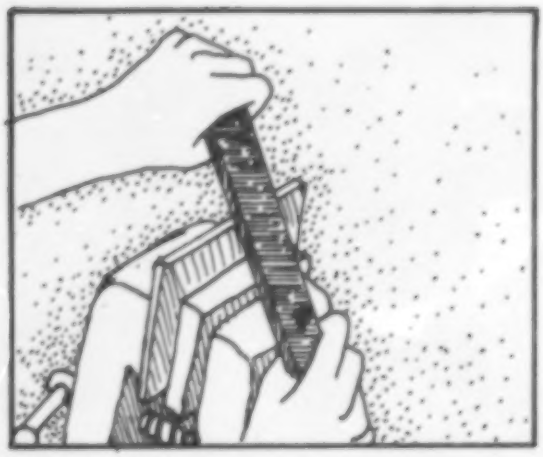
Given the necessary tools and equipment, each student will shape and deburr buckle blank until the corners and edges are rounded and smooth.



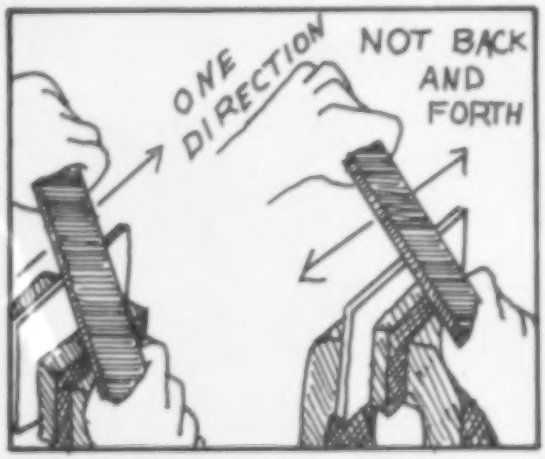
STEP 1 – Move to the Yellow Area and secure a file.



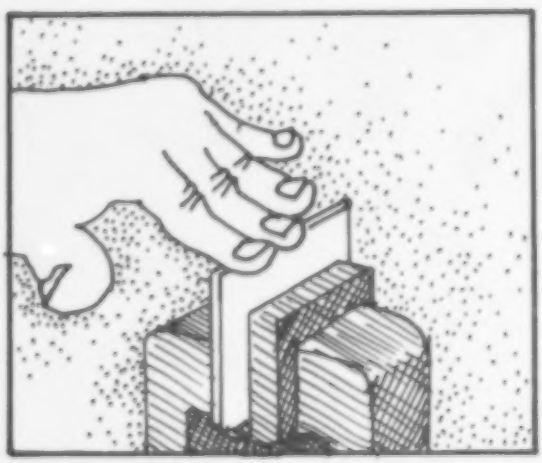
STEP 2 – Clamp your 3 1/2"(8.89 cm) blank in vise with one end up.



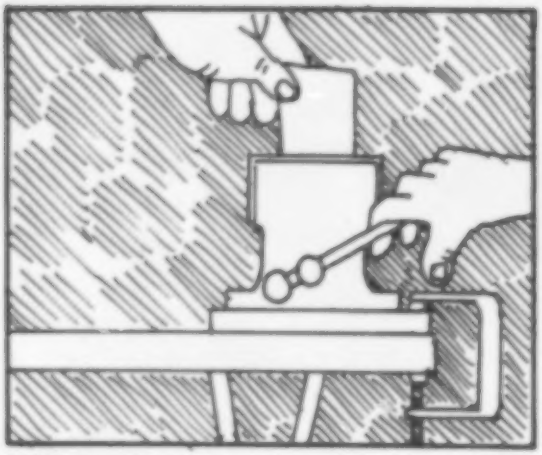
STEP 3 – File edge in a smooth even motion.



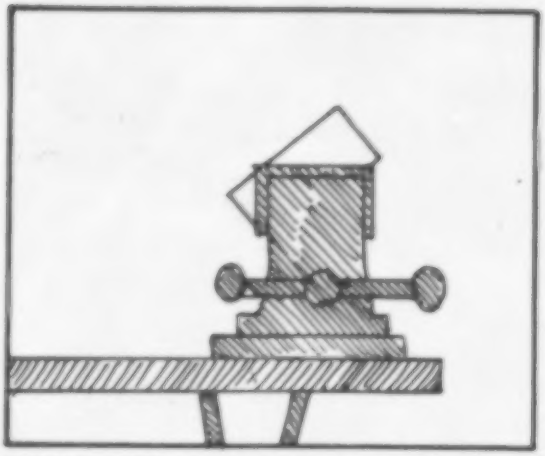
STEP 4 – Work only in one direction – forward. Do not file back and forth.



STEP 5 – The edge should be smooth enough to rub your finger over it without feeling any rough spots.

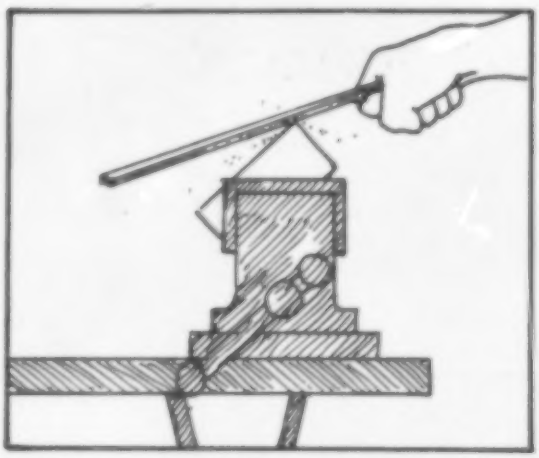


STEP 6 – Reclamp the metal in the vise with another side up.

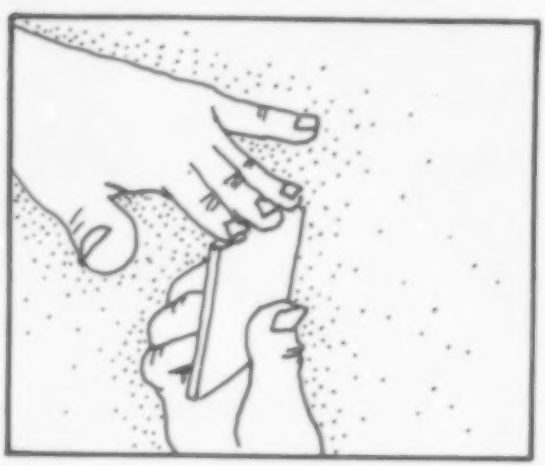


STEP 9 – Clamp the metal in a vise with one corner facing up.

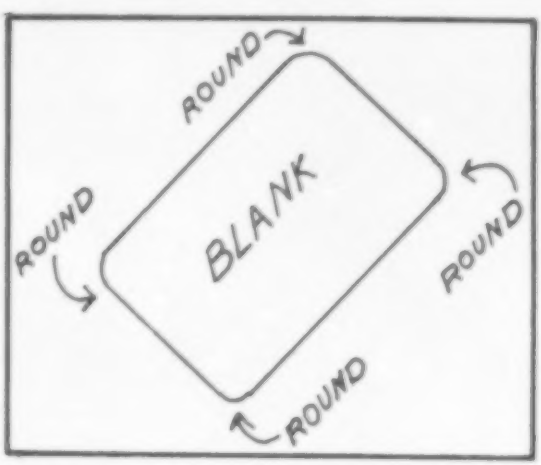
STEP 7 – File this edge until a smooth surface has developed.



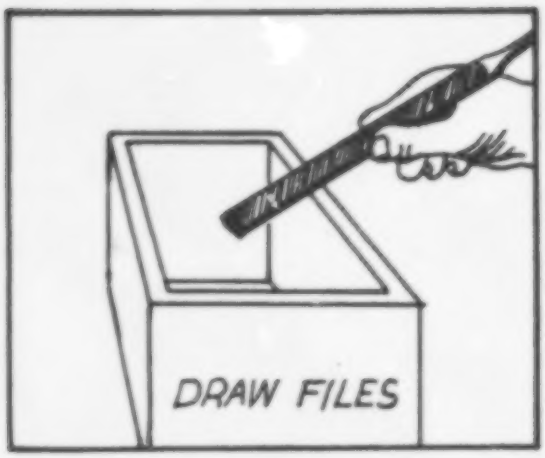
STEP 10 – Round-off the square corner using a file. Remember file only in one direction – forward. Do not file back and forth.



STEP 8 – File all four sides of the metal using the method in Steps 3-6.



STEP 11 – Round all four corners of the metal using the file.



STEP 12 – Return the file to the box labeled "File."

Check Point

Answer the following questions on the Yellow Area checklist in your Checklist Booklet.

DO NOT WRITE IN THIS MANUAL.

Check "yes" or "no."

1. Is your buckle blank smooth on all four sides?

   yes___ no___

2. Are the corners of the blank round?

   yes___ no___

3. Do you work back and forth with a draw file?

   yes___ no___

4. Do you work in only one direction?

   yes___ no___

After you have answered these questions have your instructor check your work.

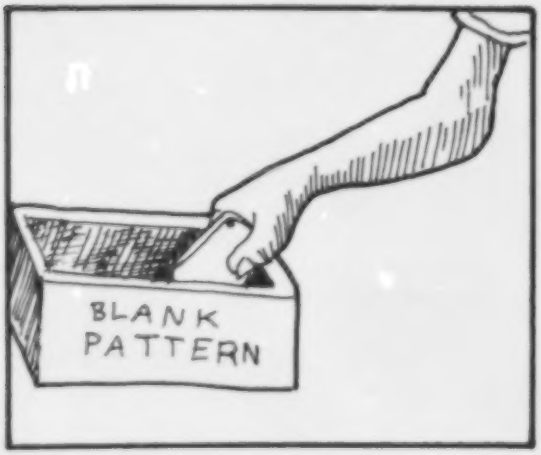
If you have successfully completed these questions, move to the Blue Area.

If you need to do more work, return to Step 1 and start over.

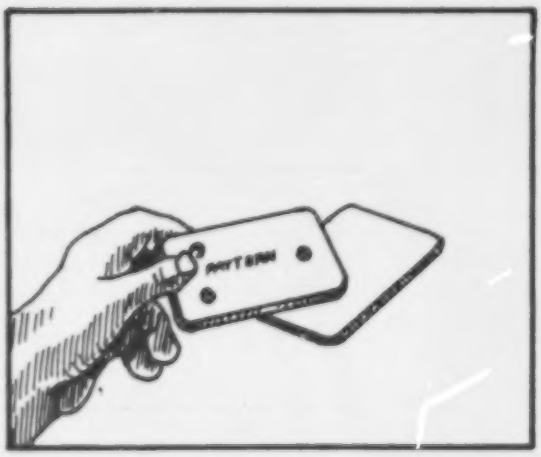
Instructional Objective III

BLUE AREA – DRILLING

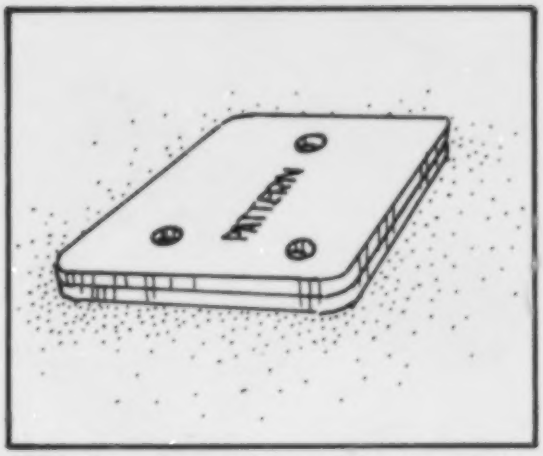
Given the proper tools and equipment each student will locate and drill three (3) holes.



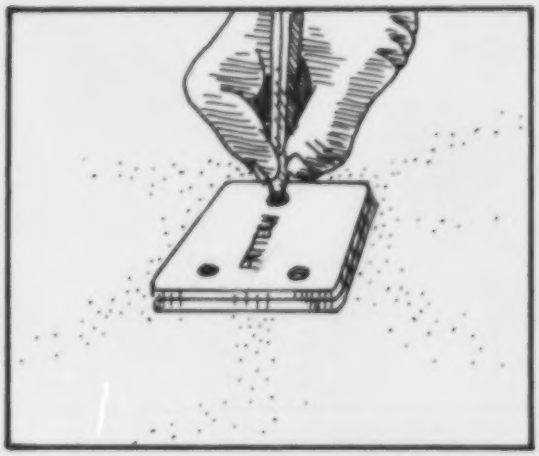
STEP 1 – Move to the Blue Area and obtain a blank pattern.



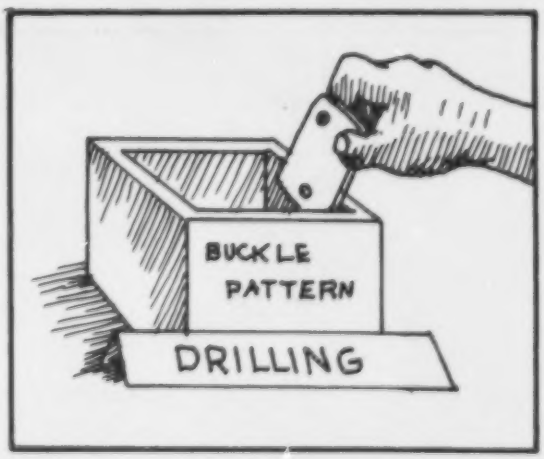
STEP 2 – Position the pattern on top of your belt buckle blank.



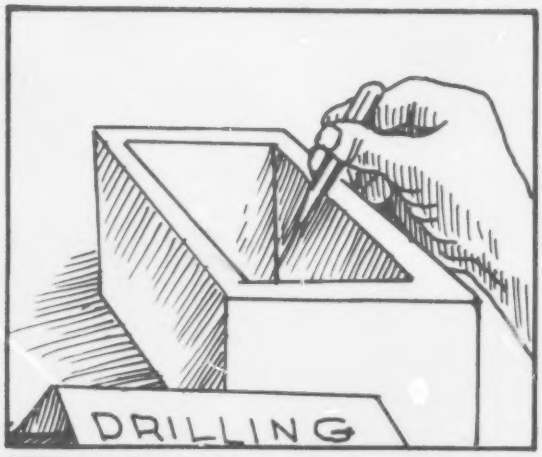
STEP 3 – Even all four (4) sides of the pattern with the belt buckle.



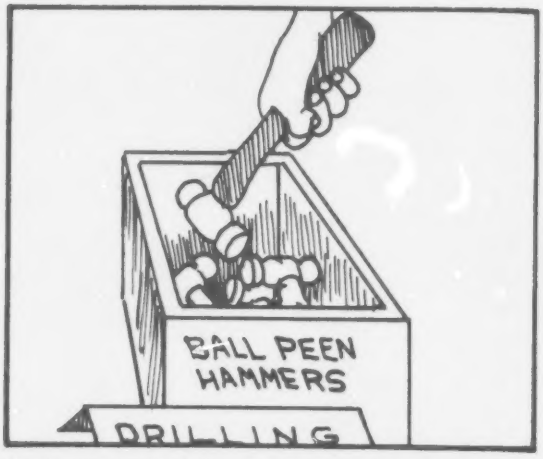
STEP 4 – Using a pencil, mark the holes to be drilled.



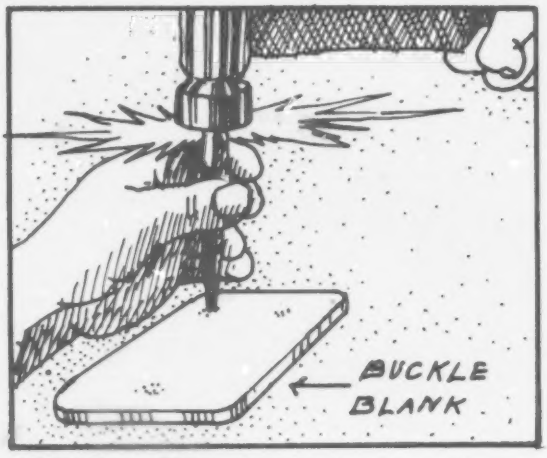
STEP 5 – Return the pattern to the appropriate area on the Blue Area table.



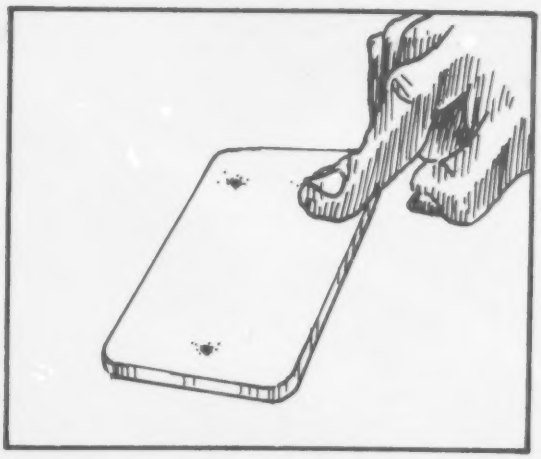
STEP 6 – Obtain a punch.



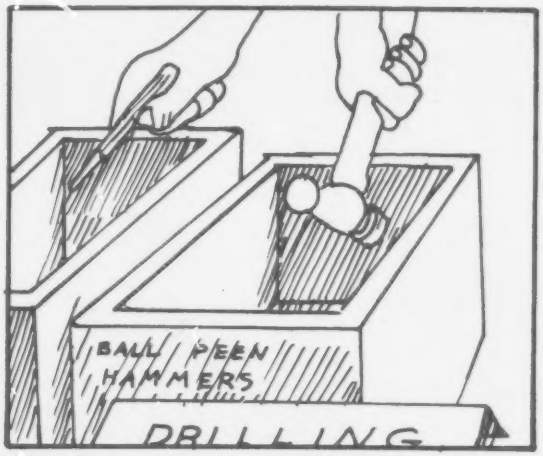
STEP 7 – Obtain a ball peen hammer from the Blue Area table.



STEP 8 – Place the punch on marks and strike the punch with the ball peen hammer.

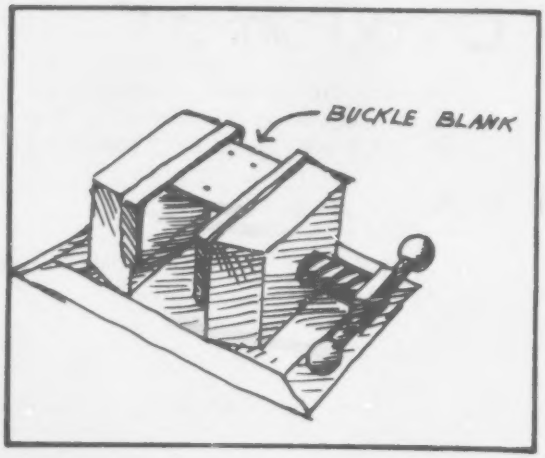


STEP 9 – Your blank should have three (3) dents or punch marks located on it.

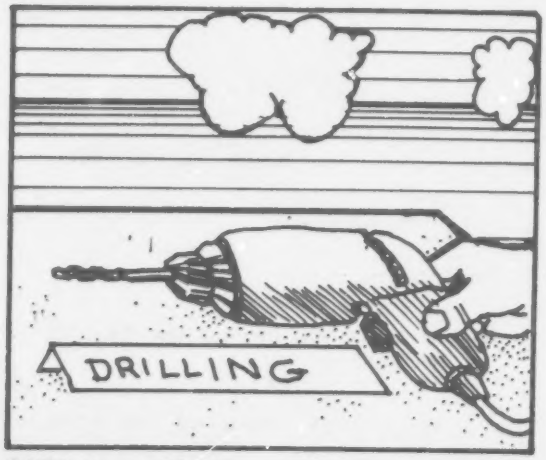


STEP 10 – Return the punch and hammer to the boxes labeled "Punches" and "Ball Peen Hammers."

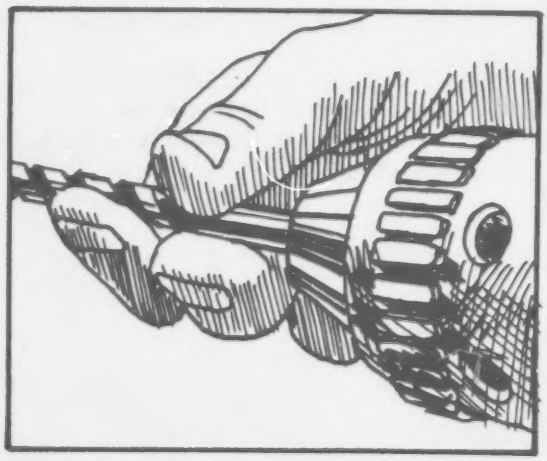
STEP 11 – Put on a pair of safety glasses.



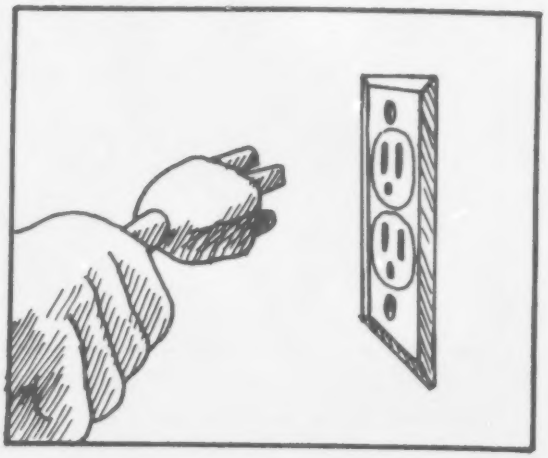
STEP 12 – Clamp belt buckle blank in vise mounted on center table with punch marks up.



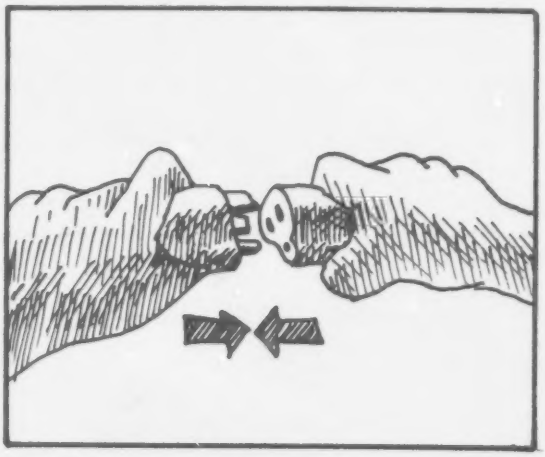
STEP 13 – Obtain a 1/4" electric drill with 1/8" drill bit in it.



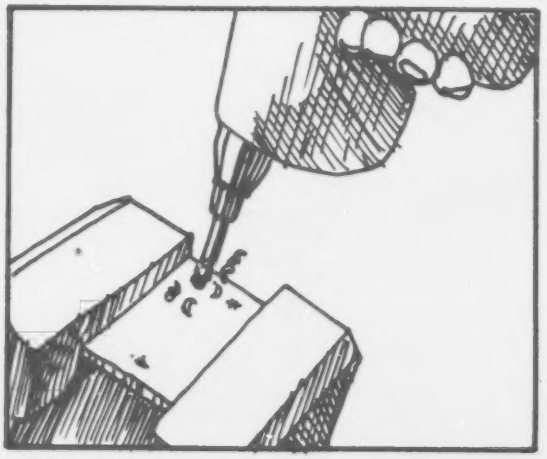
STEP 14 – Check to make sure bit is tight in the chuck.



STEP 15 – Plug drop cord into a wall outlet and extend it to the center table vises.

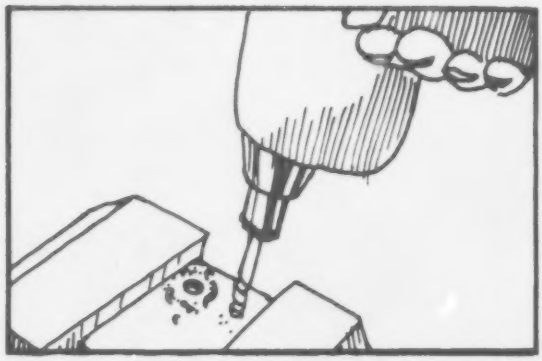


STEP 16 – Plug drill into the drop cord.

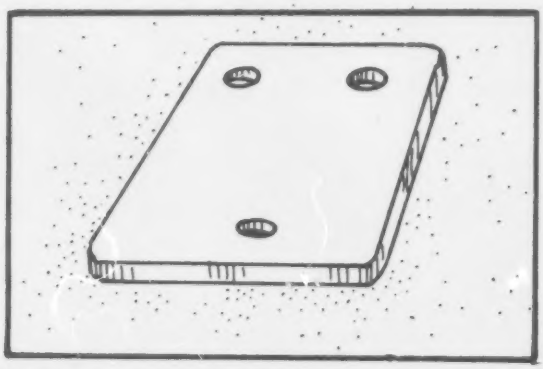


STEP 17 – Place tip of bit on one of the punched marks. The drill bit will start easier when placed on a punched mark.

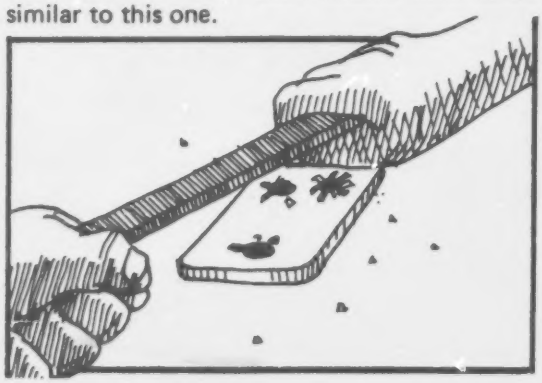
83



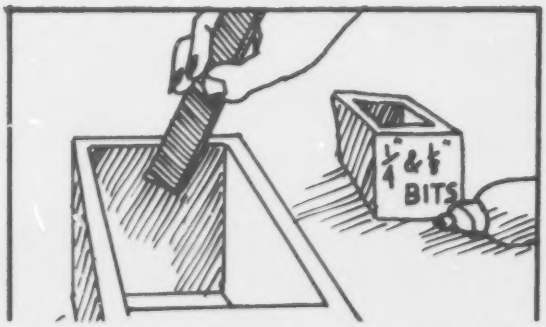
STEP 18 – Drill a hole through the buckle blank. Drill all three punched marks.



STEP 19 – Your blank should now look similar to this one.



STEP 20 – With a file remove any burrs from back side of belt buckle.



STEP 21 – Return tools to their appropriate places located in the Blue Area.

Check Point

Answer the following questions on the Blue Area checklist in your Checklist Booklet. DO NOT WRITE IN THIS MANUAL.

Check "yes" or "no."

1. Do you have three (3) holes in your buckle blank?

   yes___ no___

2. Have you removed all burrs from the holes drilled?

   yes___ no___

3. Did you use the buckle pattern to layout your holes?

   yes___ no___

4. Have you placed all tools and materials back in their proper labeled places?

   yes___ no___

Circle best answer.

5. Why did you use a punch to mark holes for drilling?

   a. so you could see the holes to be drilled
   b. so drill bit would start easier

After you have completed these questions, have your instructor check your work.

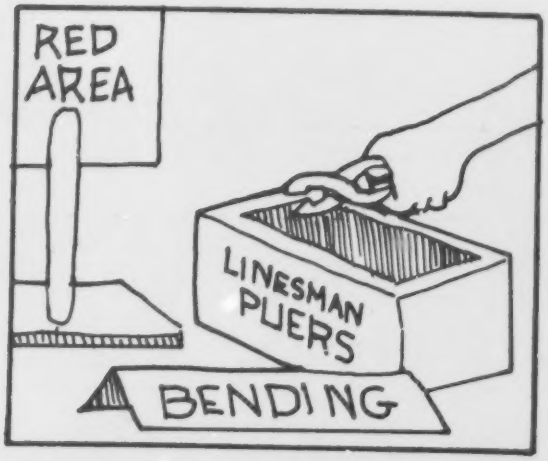
If you have successfully completed these questions, move to the Red Area.

If you need to do additional work, redo this objective.

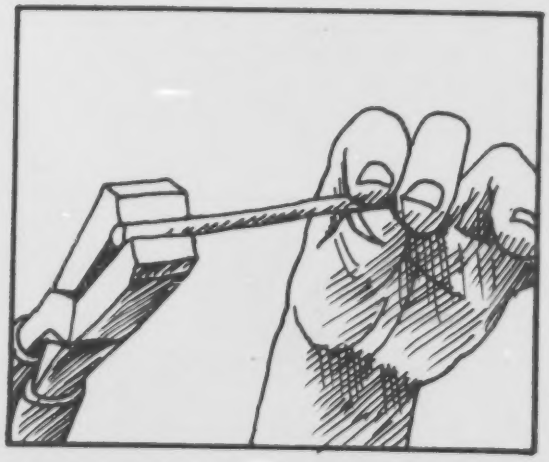
Instructional Objective IV

RED AREA – BENDING

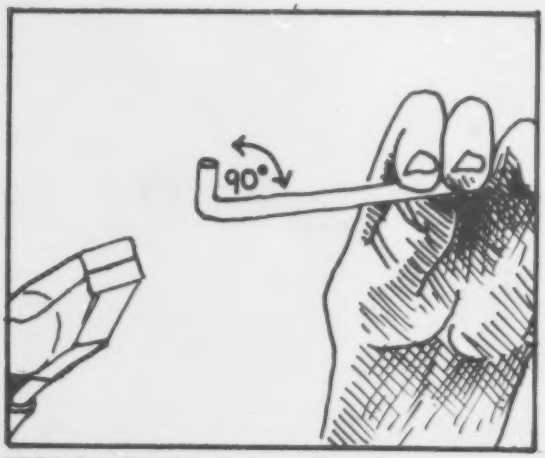
Given the proper tools and equipment, each student will bend the 3" (7.62 cm) piece of filler rod to fit the buckle.



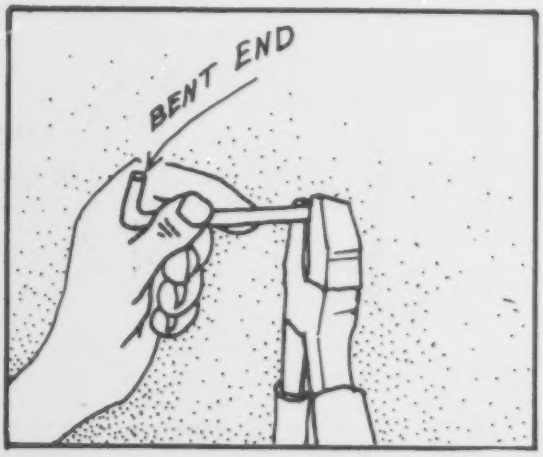
STEP 1 – Go to the Red Area and obtain a pair of pliers.



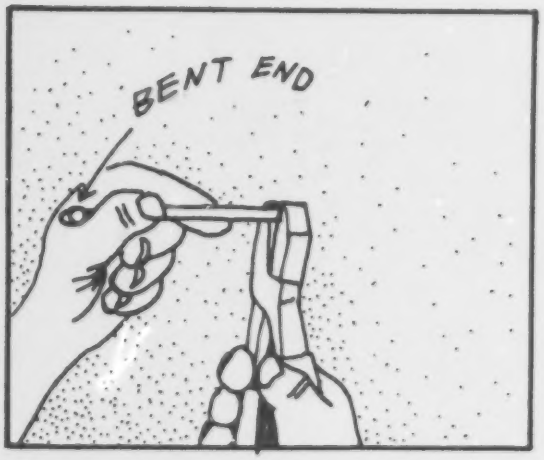
STEP 2 – Using the pliers, clamp one end of the piece of filler rod 1/2" (1.27 cm).



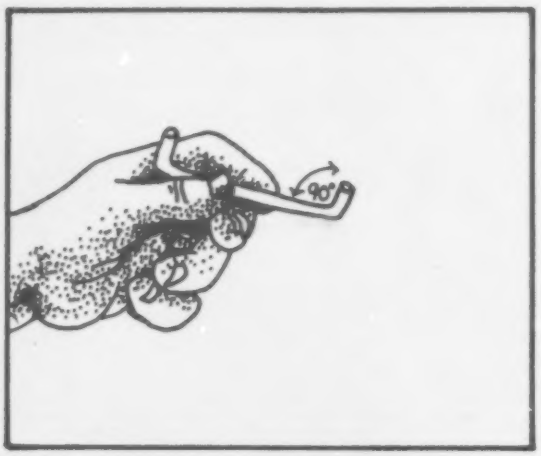
STEP 3 – Bend end of rod 90 degrees to form "L." NOTE: You may have to use a vise to help you bend the filler rod.



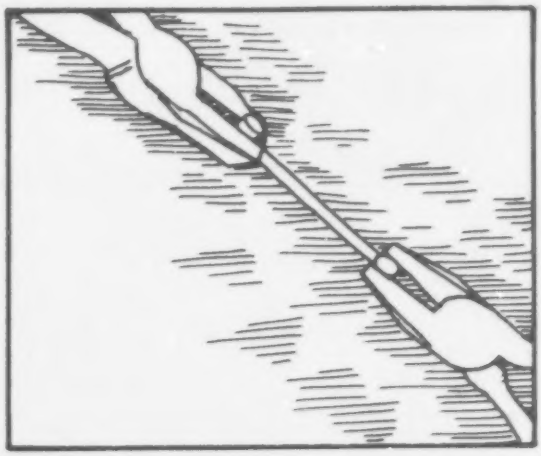
STEP 4 – Clamp other end of filler rod 1/2" using the pliers.



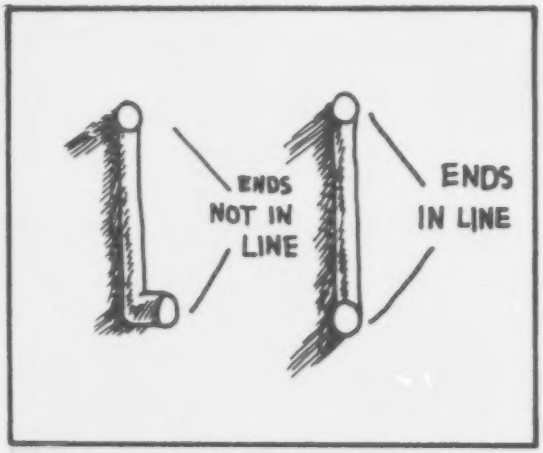
STEP 5 – Turn rod so bent end is facing you.



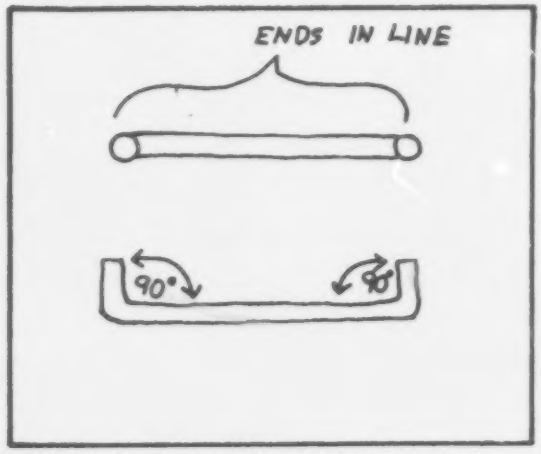
STEP 6 – Bend this end 90 degrees.



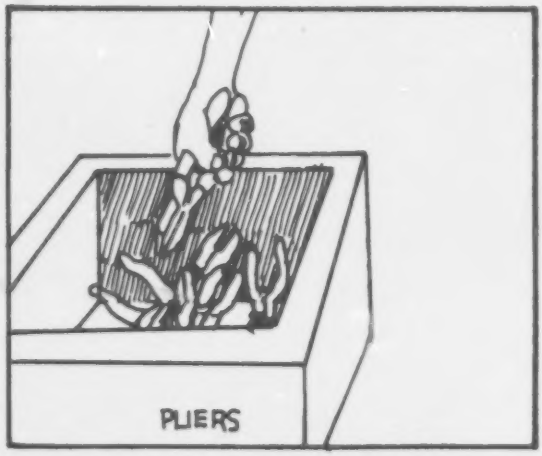
STEP 9 – Clamp each end and straighten filler rod.



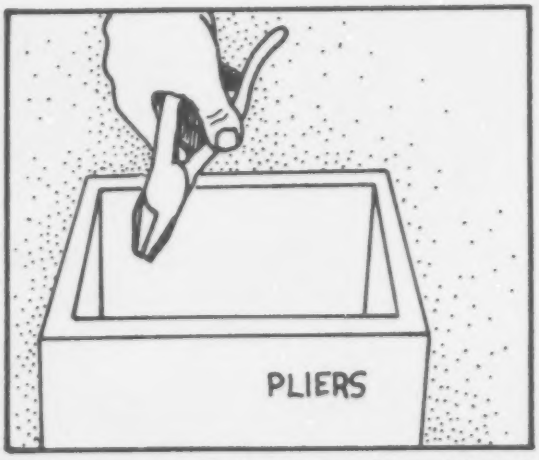
STEP 7 – It may be necessary to straighten filler rod so bent ends will be in line with each other.



STEP 10 – Your rod should look like this.



STEP 8 – If this is needed obtain a second pair of pliers.



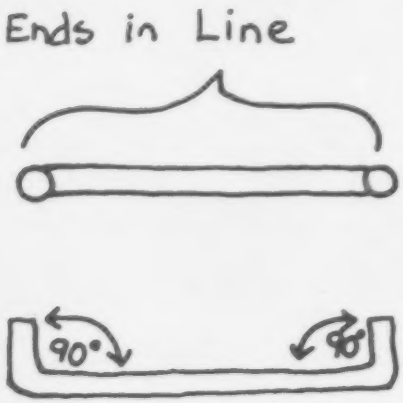
STEP 11 – Return the pliers to boxes labeled "Pliers" in Red Area.

Check Point

Answer the following questions on the Red Area checklist in your Checklist Booklet. DO NOT WRITE IN THIS MANUAL.

Check "yes" or "no."

1. Does your filler rod now have this shape?



yes___ no___

2. Are the ends bent in line with one another?

yes___ no___

If you have answered these questions, have your instructor check your work.

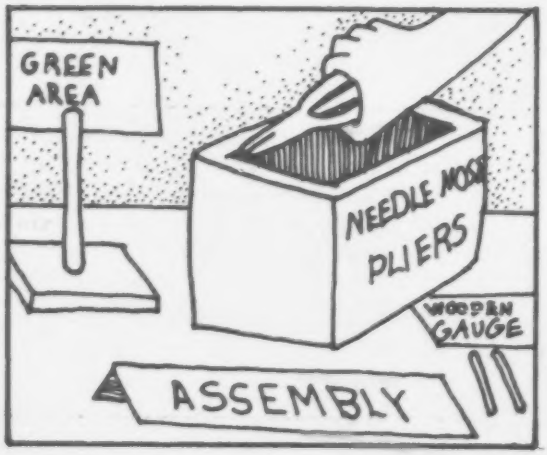
If you have successfully completed this checklist, move to the Green Area.

If you need to do additional work return to Step 1 and start over.

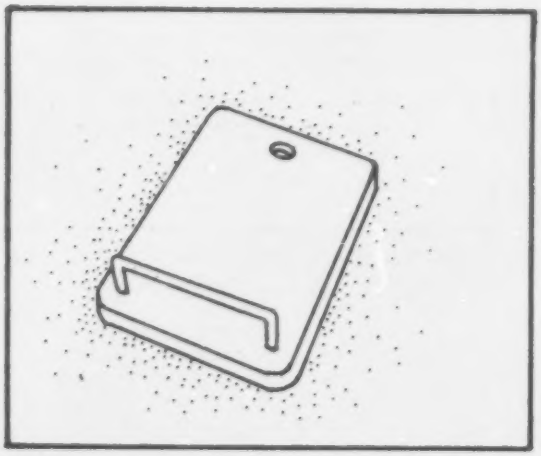
Instructional Objective V

GREEN AREA – ASSEMBLY

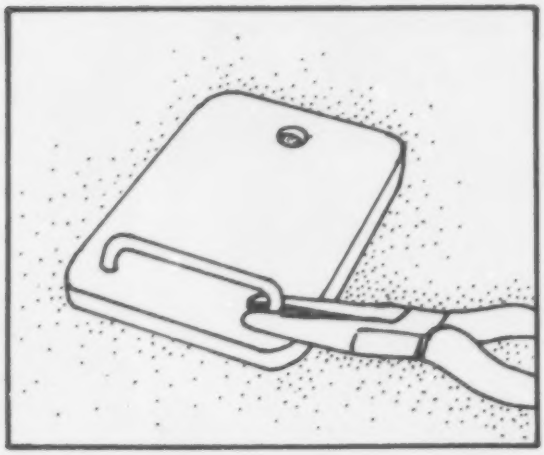
Given the necessary tools and equipment, the student will properly assemble the belt buckle for welding.



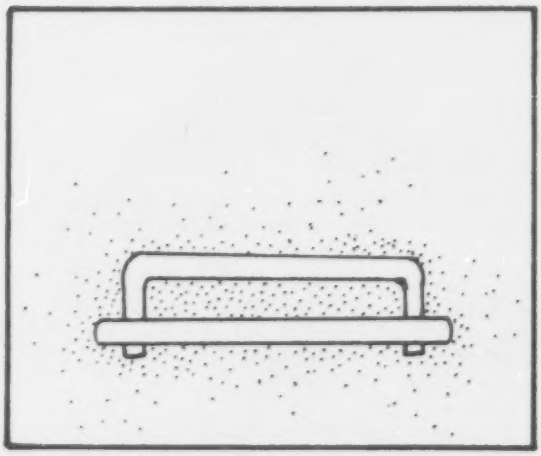
STEP 1 – Move to the Green Area and secure a pair of needle nose pliers.



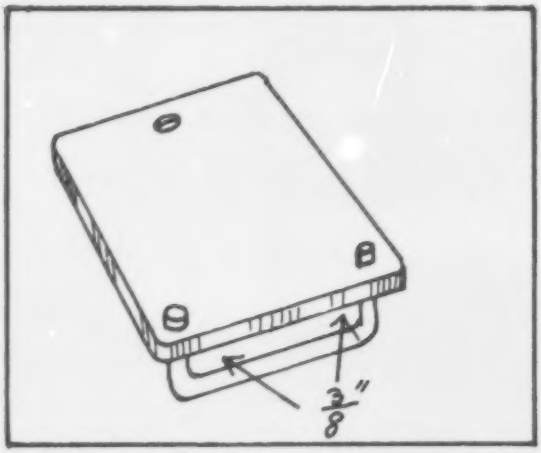
STEP 2 – Insert one end of the 3"(7.62 cm) bent filler rod (belt holder) in one hole on buckle blank.



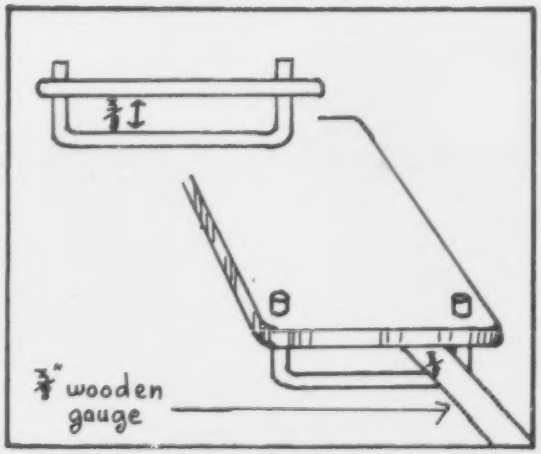
STEP 3 – Clamp other bent end of belt holder with pliers and adjust it to fit the second hole in buckle blank. NOTE: You may need to bend one end a little so end will slip through holes in buckle blank.



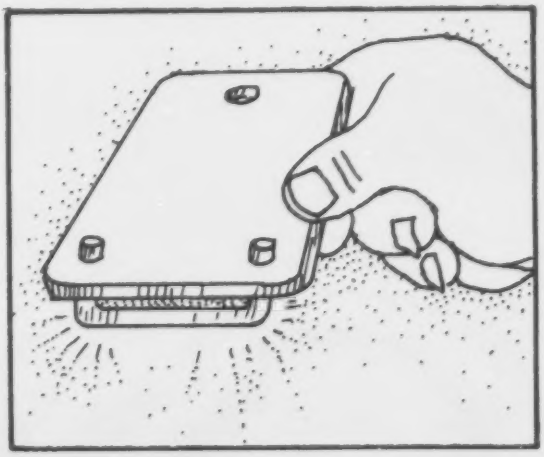
STEP 4 – Both ends of the filler rod should be protruding through the buckle.



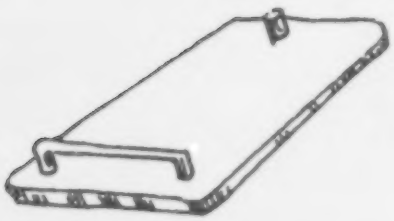
STEP 5 – Adjust the distance between belt holder (filler rod) and buckle blank.



STEP 7 – The distance between the rod and buckle should be at least 3/8 of an inch (.9525 cm). Use 3/8" wooden gauge. NOTE: This distance is necessary for a belt to fit on the buckle.



STEP 6 – You may tap the rod on a table. The rod should fit snugly.



STEP 8 – Your buckle should look like this.

STEP 9 – Return the pliers and wooden gauge to the boxes labeled "Needle Nose Pliers" and "Wooden Gauge."

Check Point

Answer the following questions on the Green Area checklist in your Checklist Booklet.

DO NOT WRITE IN THIS MANUAL.

Circle "yes" or "no."

1. Is the distance at least 3/8 of an inch between the belt holder (filler rod) and buckle blank?

   yes___ no___

2. Did you use the wooden gauge to test it?

   yes___ no___

3. Does your belt holder fit snugly in your buckle blank?

   yes___ no___

If you have answered these questions, have your instructor check your work.

If you have successfully completed this checklist, move to the Brown Area.

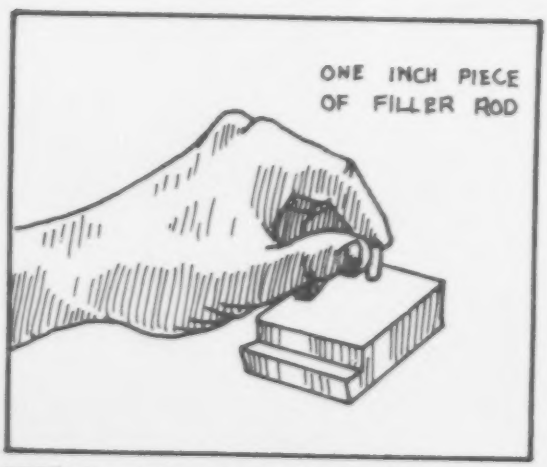
If you need to do additional work, return to Step 1 and redo the objective.

Instructional Objective VI

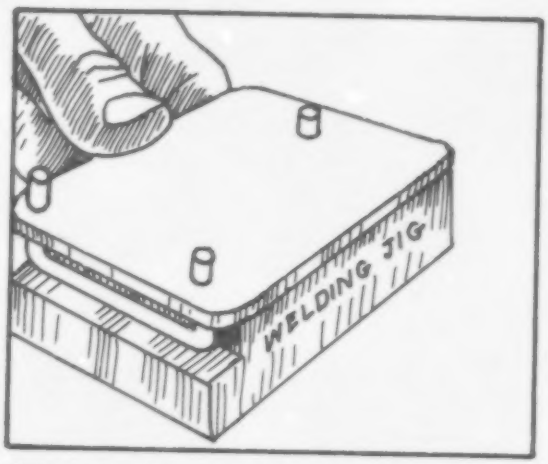
BROWN AREA – WELDING – Option 1
(Consult your instructor to see if you should complete Objective VI or VII.)

Given the proper tools, equipment and instruction, the student will safely weld the belt holder and hook.

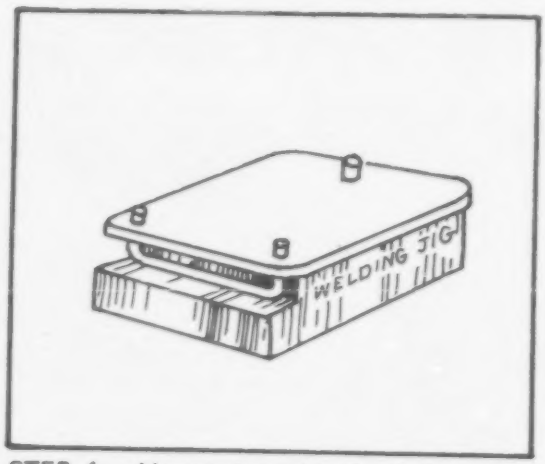
STEP 1 – Move to the Brown Area and obtain one welding jig.



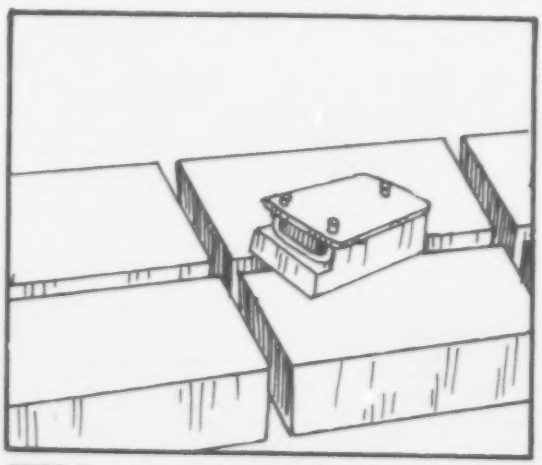
STEP 2 – Place the 1" (2.54 cm) piece of filler rod in hole located at top of welding jig.



STEP 3 – Place buckle blank on jig with 1" (2.54 cm) rod protruding through center hole. NOTE: Belt holder is down.

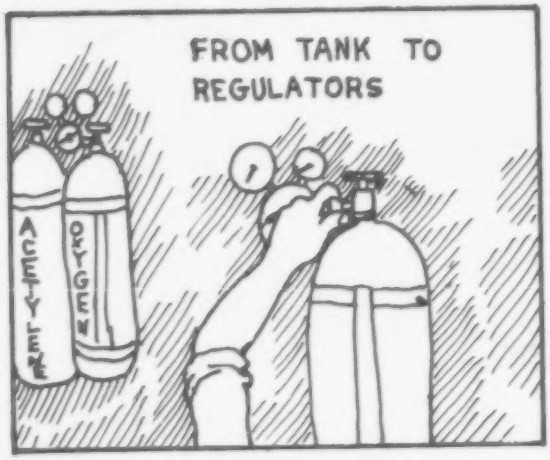


STEP 4 – Your belt buckle should look like this before you weld.

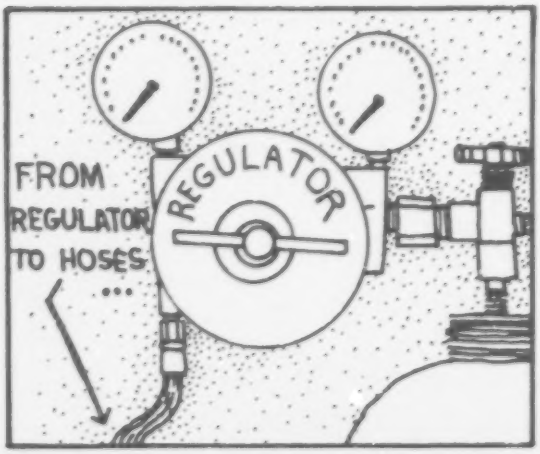


STEP 5 – Locate the welding jig on bricks in the welding area.

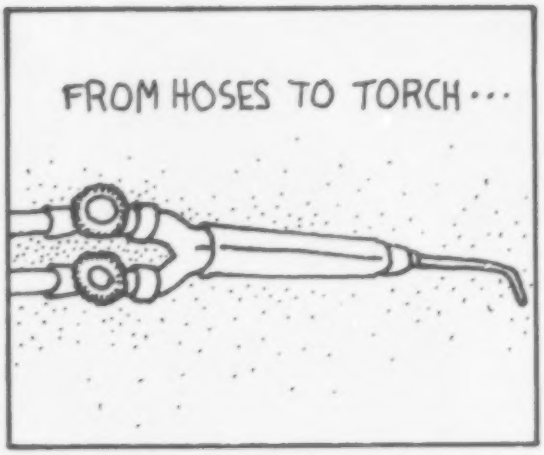
STEP 6 – Read safety rules pertaining to setting up oxygen-acetylene welding outfit. These rules are listed on the safety poster in the welding area.



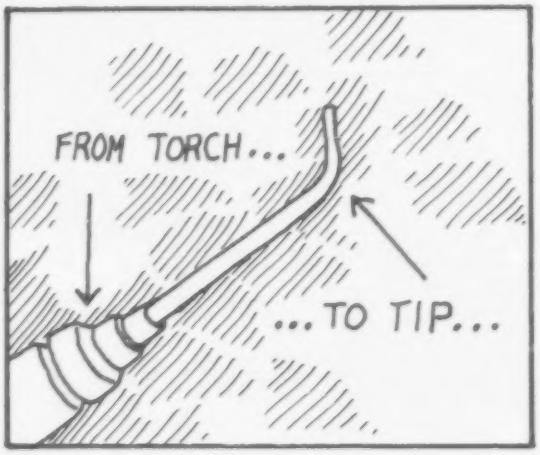
STEP 7 – Check fittings from tanks to regulators on both oxygen (O_2) and acetylene. These fittings should be tight.



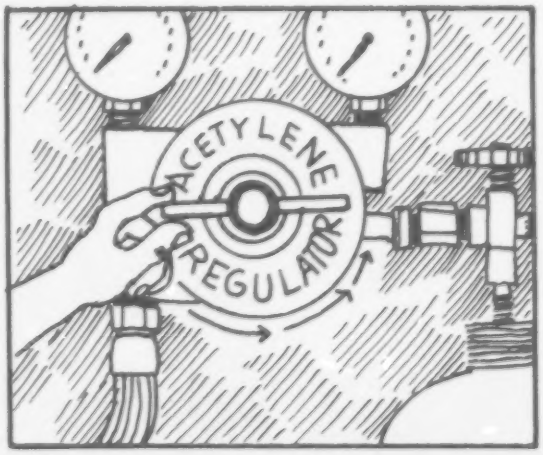
STEP 8 – Check fittings from gauges to hoses,



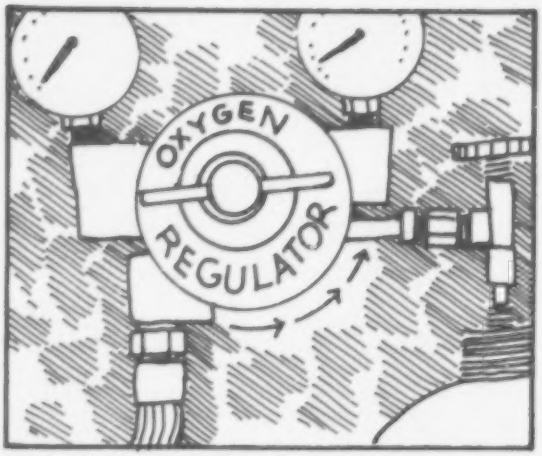
STEP 9 – and from hoses to torch.



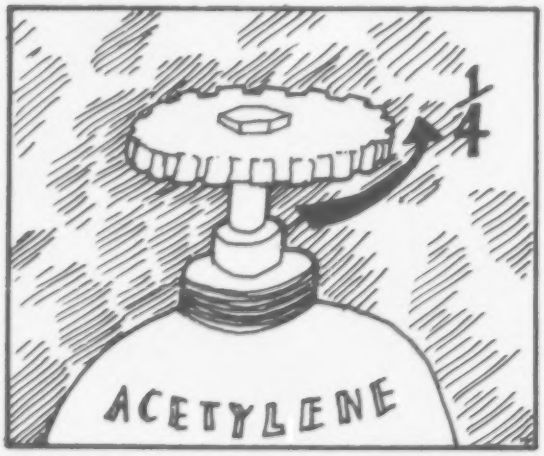
STEP 10 – Make sure tip is tight in torch.



STEP 11 – Check thumbscrew on acetylene regulator. It should be very loose. If necessary, loosen by turning counterclockwise.

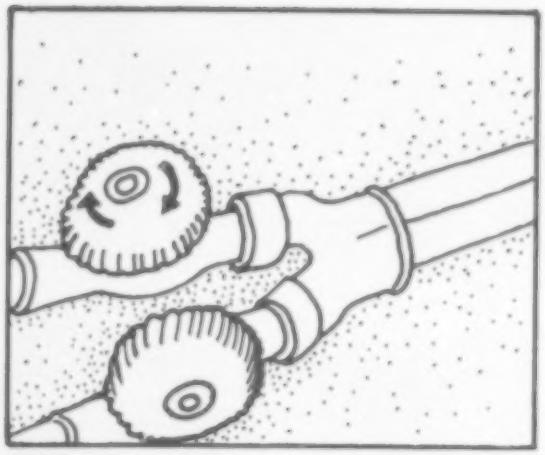


STEP 12 – Check thumbscrew on oxygen tank regulator. It should also be loose or very easy to turn. If necessary, loosen by turning counterclockwise.

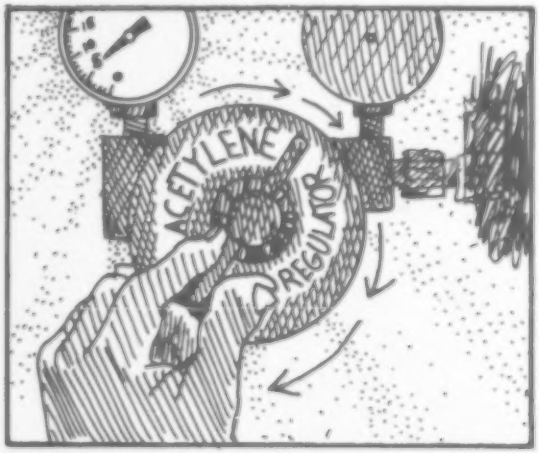


STEP 13 – Open acetylene tank valve 1/4 of a turn.

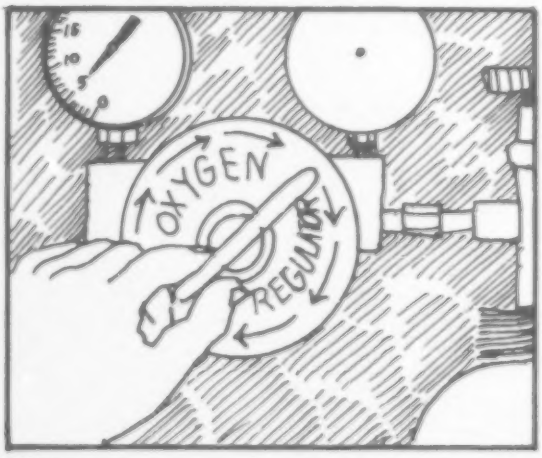
STEP 14 – Open oxygen tank valve all the way.



STEP 15 – Check acetylene and oxygen adjustment valve at torch. They should be closed. Turn clockwise to close.



STEP 16 – Turn thumbscrew on acetylene regulator clockwise until pressure reads 5 psi. SAFETY NOTE – Do not exceed 5 psi.



STEP 17 – Turn thumbscrew on oxygen regulator clockwise until pressure reads 5 psi.

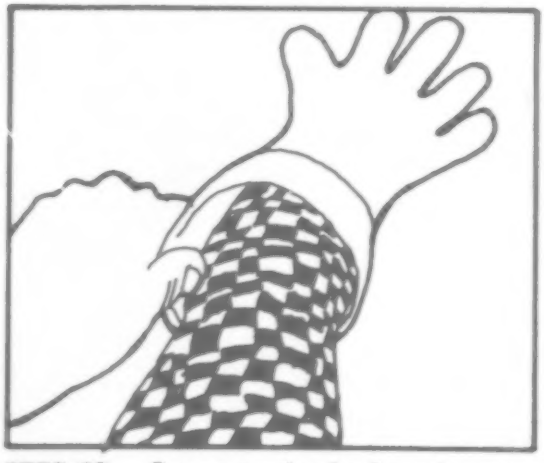
STEP 18 – Your oxygen-acetylene welding outfit is now set up ready for welding.

STEP 19 – Read Safety Poster No. 2.

STEP 20 – Put on a protective apron.

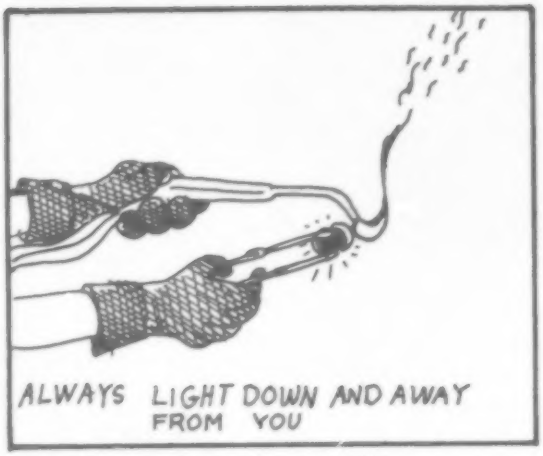
STEP 21 – Put on a pair of oxygen-acetylene welding goggles. SAFETY NOTE – Only those goggles located in this area are to be worn.

STEP 22 – Tie back any loose hair or clothing that may be in your way when bending over.

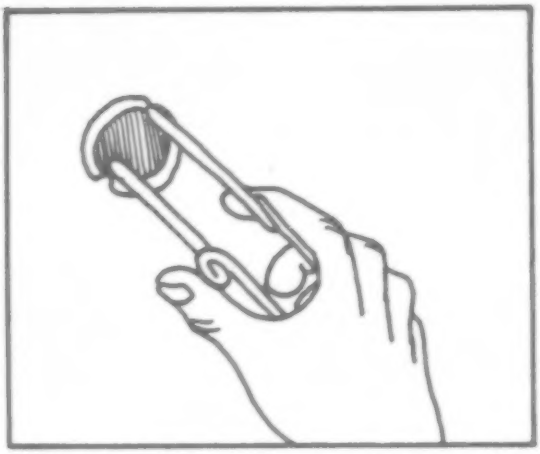


STEP 23 – Put on a pair of safety gloves to prevent burns.

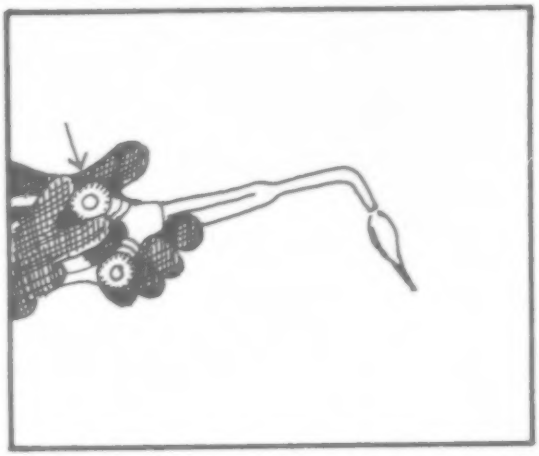
STEP 24 – Read Safety Poster No. 3.



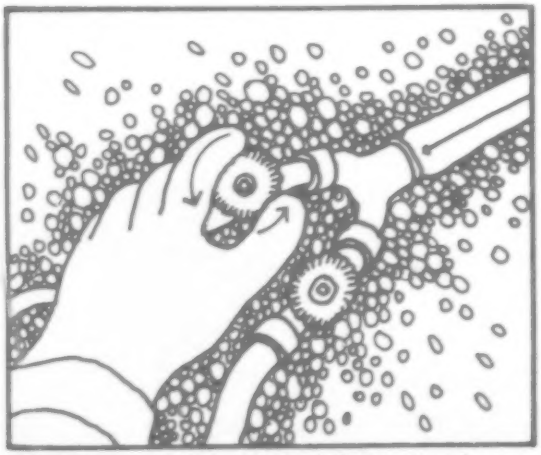
STEP 27 – Light torch with strikers.



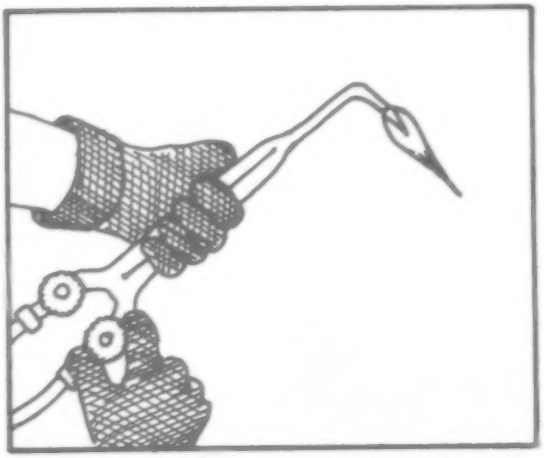
STEP 25 – Grasp strikers located at welding area with right hand.



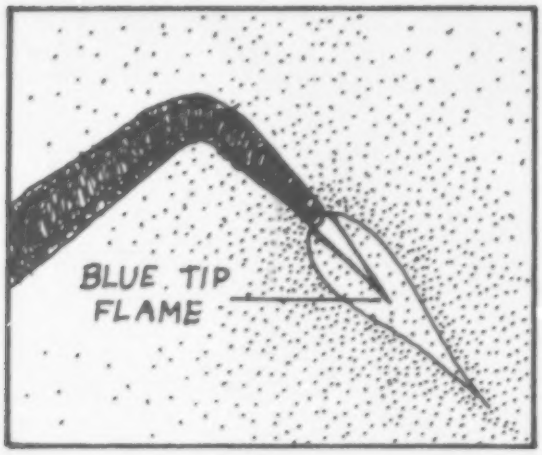
STEP 28 – Slowly open acetylene valve until black soot disappears.



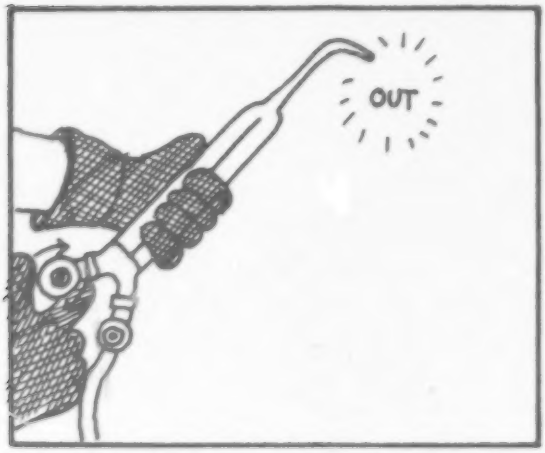
STEP 26 – Hold torch in left hand and open acetylene valve just a little bit. SAFETY NOTE – Point torch away from anyone.



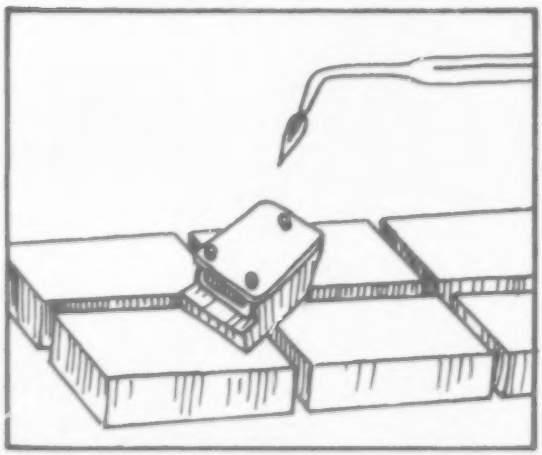
STEP 29 – Open oxygen valve slowly and bring flame down to a neutral one. NOTE – A neutral flame appears as such.



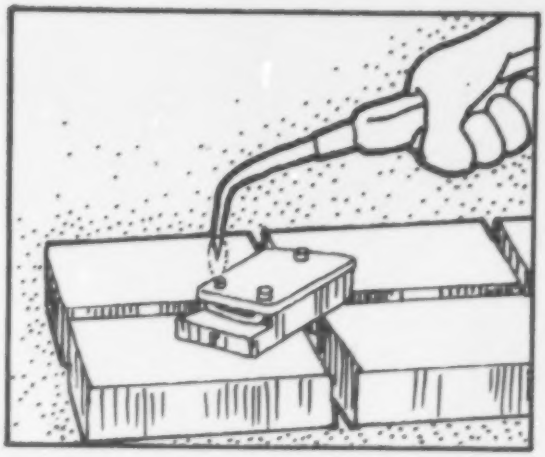
STEP 30 – Adjust flame until the least amount of noise is heard from it.



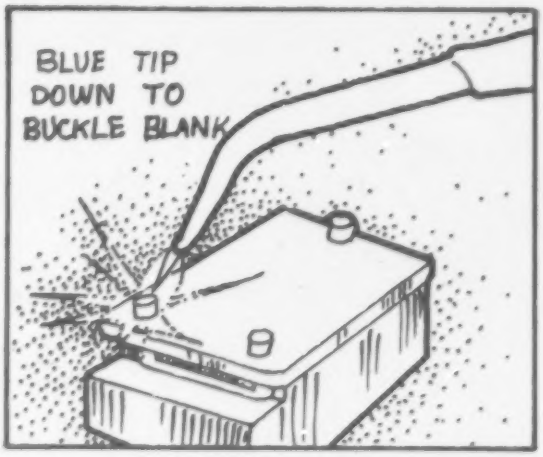
STEP 31 – If flame goes out, shut off valves by turning them clockwise and start over.



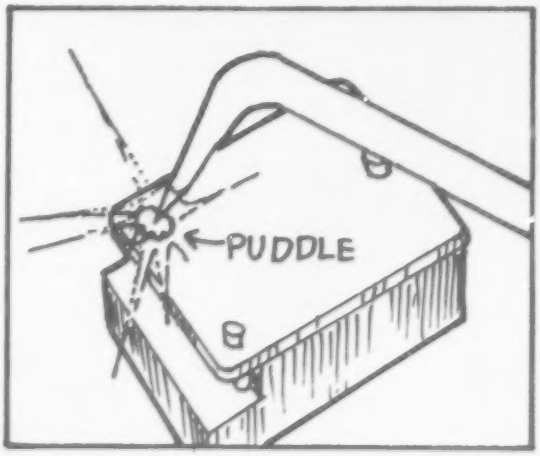
STEP 32 – Move tip of torch over to welding jig where your buckle is located.



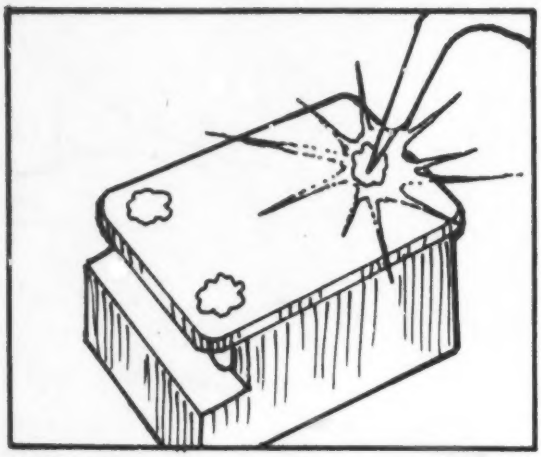
STEP 33 – Move tip of blue flame down to blank.



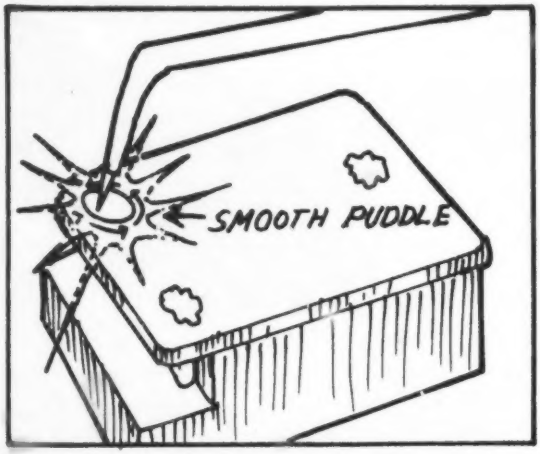
STEP 34 – Touch tip of flame to blank just on top of filler rod.



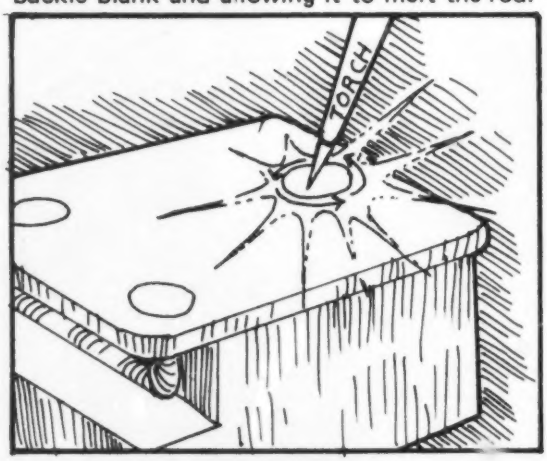
STEP 35 – Melt blank and allow the small puddle of metal to flow over and melt filler rod. NOTE – This is when the welding takes place which is called "fusion" welding.



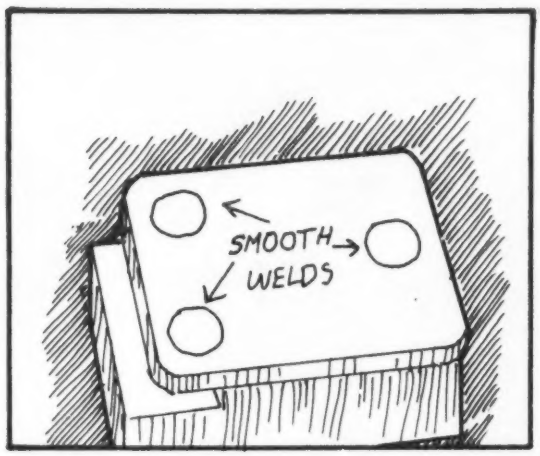
STEP 36 – Move to other two points and proceed the same way. NOTE – Remember that the tip of the flame is the hottest point and it must be touching the buckle blank to melt it.



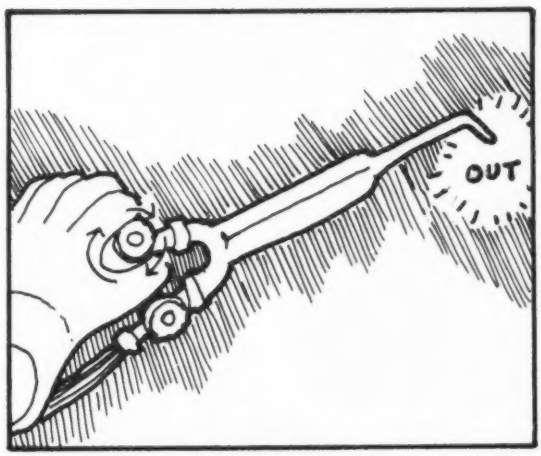
STEP 37 – Move back to the first point of welding and work around the rod, melting the buckle blank and allowing it to melt the rod.



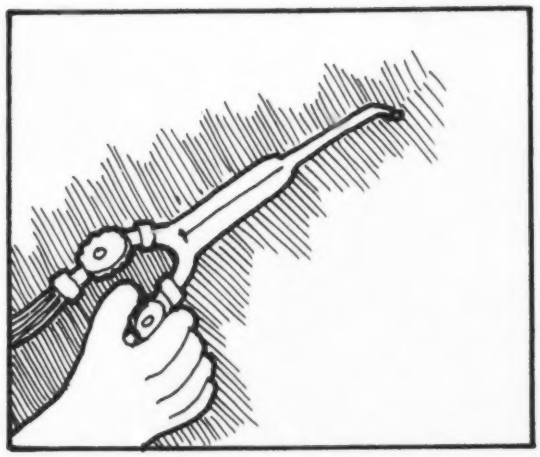
STEP 38 – Proceed to the 2nd and 3rd welding points and do the same.



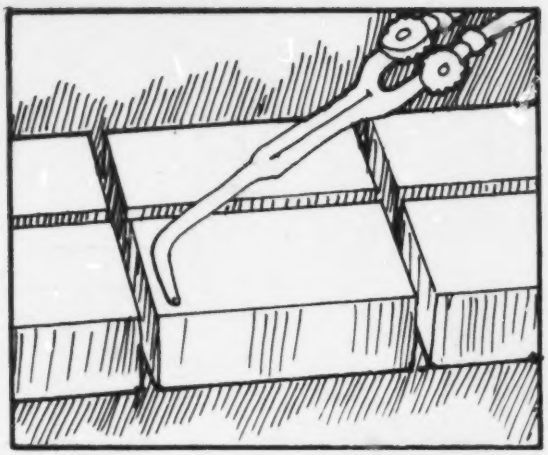
STEP 39 – Your welding should appear very smooth.



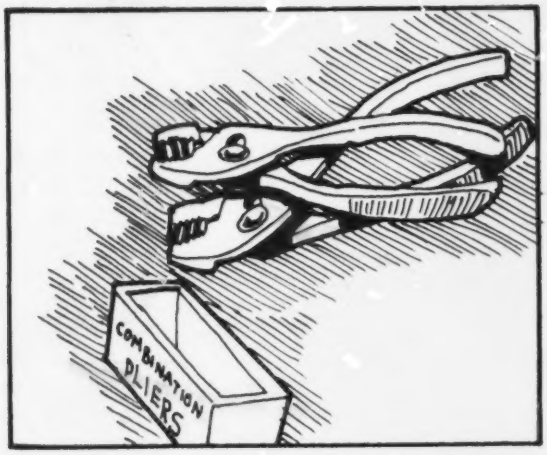
STEP 40 – Turn off acetylene valve at torch. Turn clockwise.



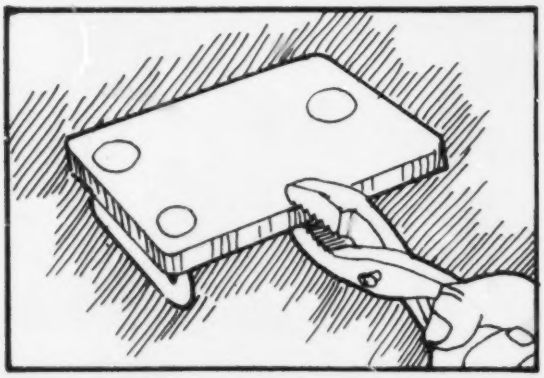
STEP 41 – Turn off oxygen valve at torch. Turn clockwise.



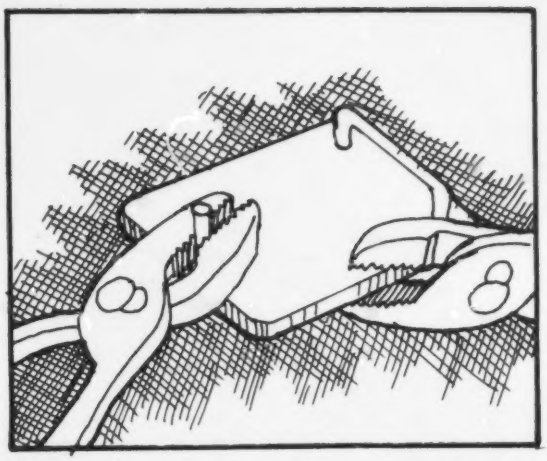
STEP 42 – Lay torch on bricks. NOTE – It is very easy to melt the rod onto metal giving a nice appearance, but no welding has taken place. The filler rod will melt faster than metal, so care must be taken to MELT the METAL, and let the METAL MELT THE FILLER ROD.



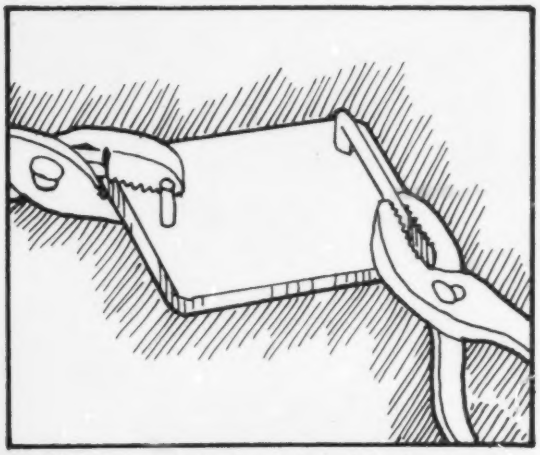
STEP 43 – Secure two pairs of pliers from Brown Area.



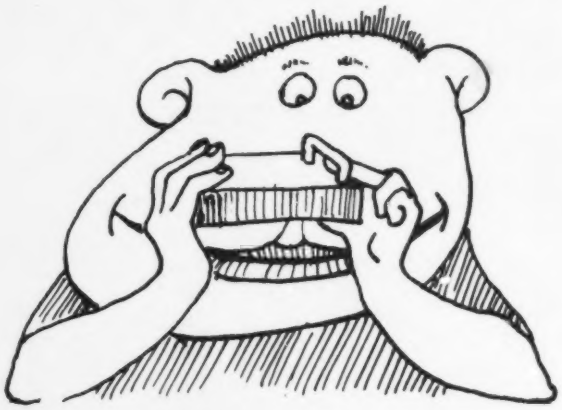
STEP 44 – Pick your work up with one pair of the pliers.



STEP 45 – With the other pair, clamp the hook (1" piece) (2.54 cm) and twist. Your hook or 1" (2.54 cm) piece should not turn in your buckle blank.

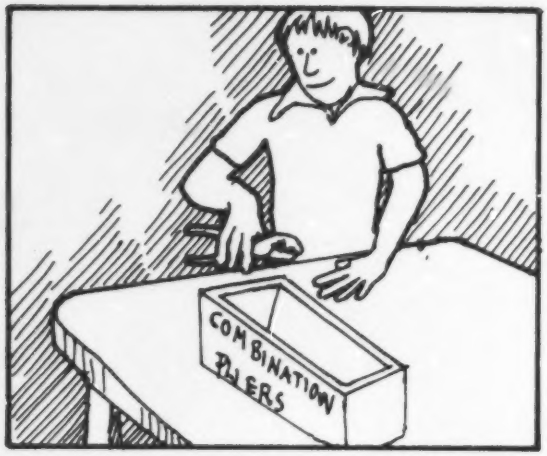


STEP 46 – Check the belt holder in the same manner. It should remain in the buckle blank.

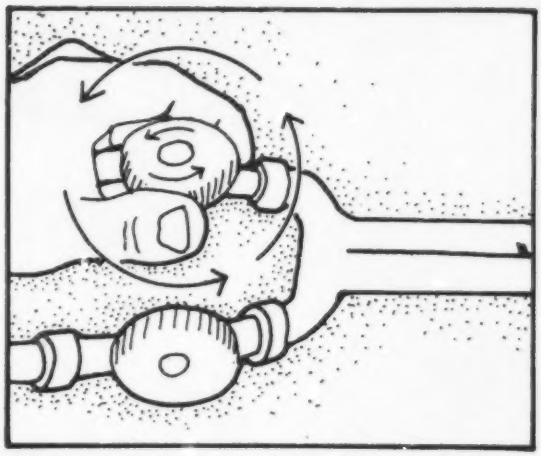


STEP 47 – If your hook or belt holder is not welded to your blank, go back to Step 24 and start again.

97

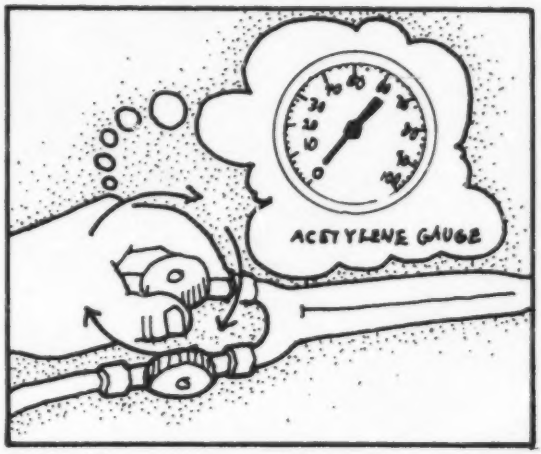


STEP 48 – If your work is properly welded lay it on the bricks and return pliers to the box labeled "Pliers."

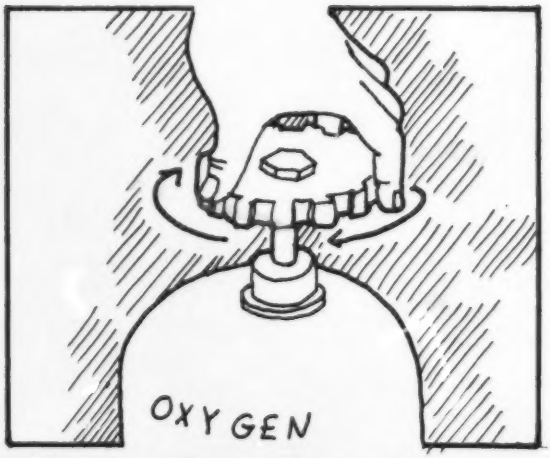


STEP 51 – Open acetylene valve at torch to "bleed" acetylene line. NOTE – "Bleed" means to release all the working line pressure between gauge and torch.

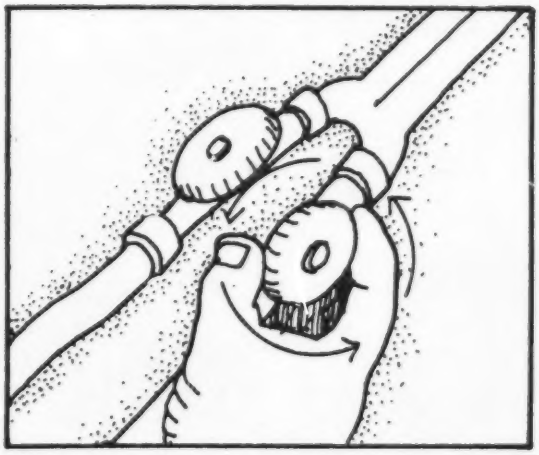
STEP 49 – Turn acetylene valve at tank clockwise to shut off.



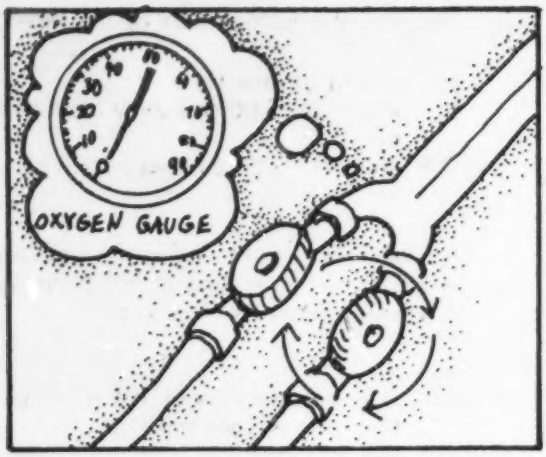
STEP 52 – Close acetylene valve at torch when all pressure is released. Turn clockwise.



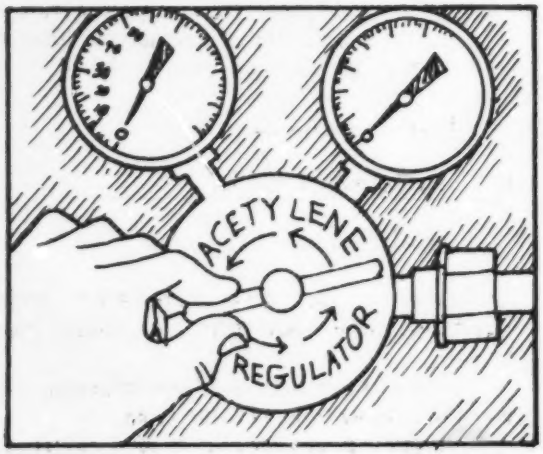
STEP 50 – Turn oxygen valve at tank clockwise to shut off.



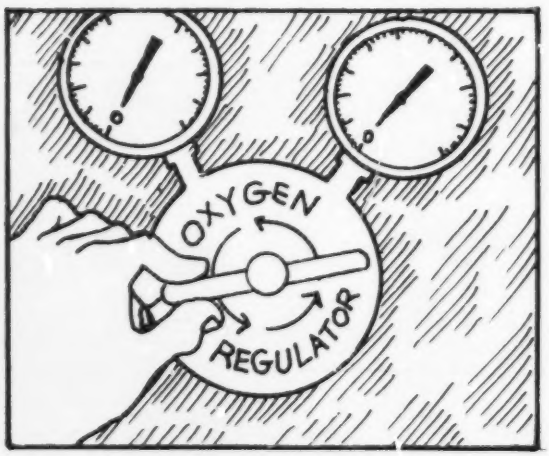
STEP 53 – Open oxygen valve at torch and "bleed" pressure.



STEP 54 — Close oxygen valve at torch. Turn clockwise.

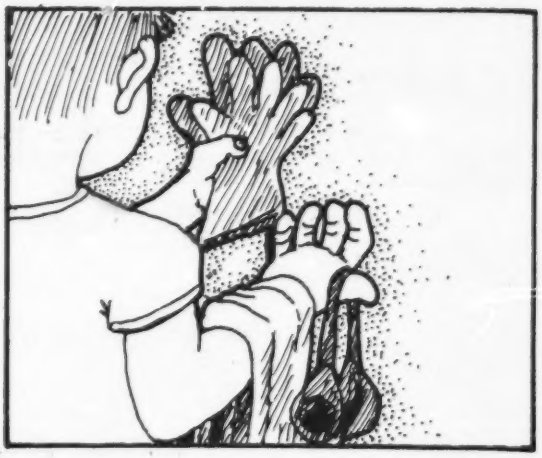


STEP 55 — Turn thumbscrew on acetylene regulator counterclockwise until screw is very easy to turn.

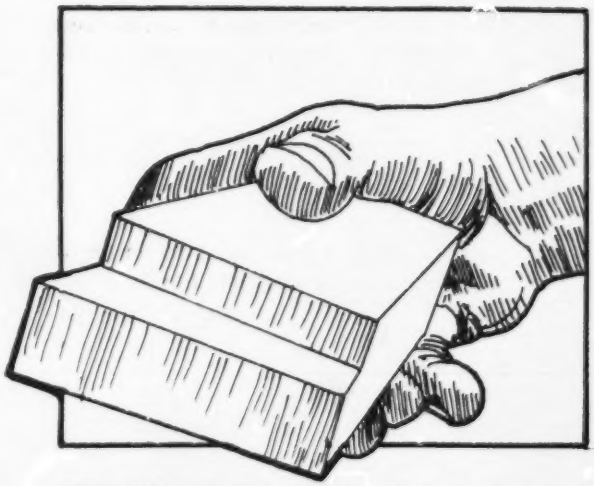


STEP 56 — Turn thumbscrew on oxygen regulator counterclockwise until screw is loose, or very easy to turn.

STEP 57 — Your tanks and welding outfit should be just as they were when you first approached them for use.



STEP 58 — Place gloves, goggles, and apron back in appropriate labeled area.



STEP 59 — Return welding jig to appropriate place.

STEP 60 – Let your belt buckle cool until you can handle it with your hands. NOTE – Metal is deceiving; it may appear cool but still be hot enough to burn badly.

Check Point

Answer the following questions on the Brown Area checklist in your Checklist Booklet.

DO NOT WRITE IN THIS MANUAL.

Check "yes" or "no."

1. Did the buckle blank melt the filler rod?

   yes___ no___ .

2. Did the filler rod melt and flow over the buckle blank?

   yes___ no___

3. Can you wear regular safety glasses (clear lenses) while using the oxygen-acetylene welding outfit?

   yes___ no ___

Circle the best answer.

4. What is the proper pressure to set on the acetylene gauge before welding?

   a. 10 psi
   b. 5 psi
   c. 11 psi
   d. 8 psi

5. Where is the hottest part of the flame?

   a. at end of blue tip
   b. about 2" (5.08 cm) away from blue tip
   c. about 1" (2.54 cm) away from blue tip

6. If your flame goes out while you are setting it up for welding or in the process of welding, what should you do?

   a. run
   b. turn acetylene valve off at torch, then turn oxygen valve off
   c. yell for help
   d. turn acetylene valve off at tank

7. When you leave the oxygen-acetylene tanks, should the thumbscrews located on the regulators be loose or tight?

   loose___ tight___

8. Is your buckle cool?

   yes___ no___

After you have completed these questions, have your instructor check your work.

If you have successfully completed this checklist, move to the Purple Area.

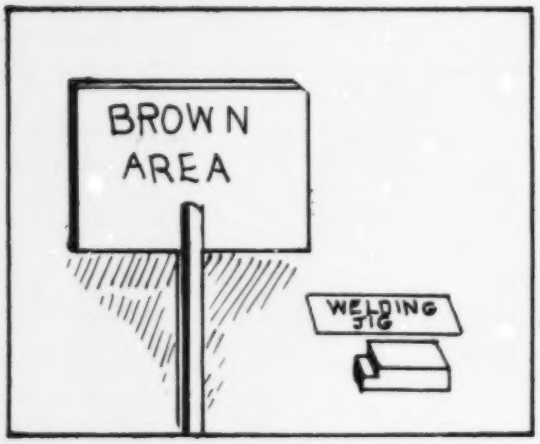
If additional work is needed return to Step 1 and start over.

100

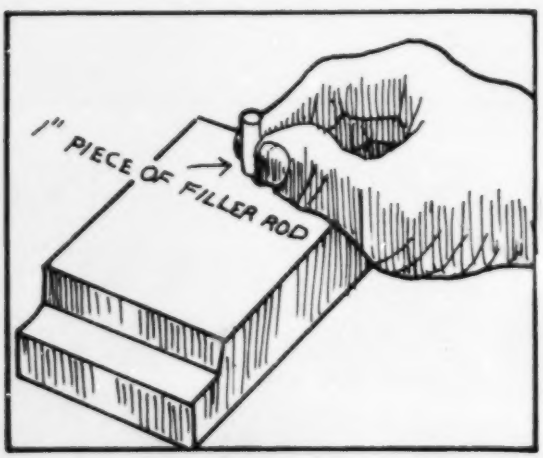
Instructional Objective VII

BROWN AREA – WELDING
OPTION NO. 2

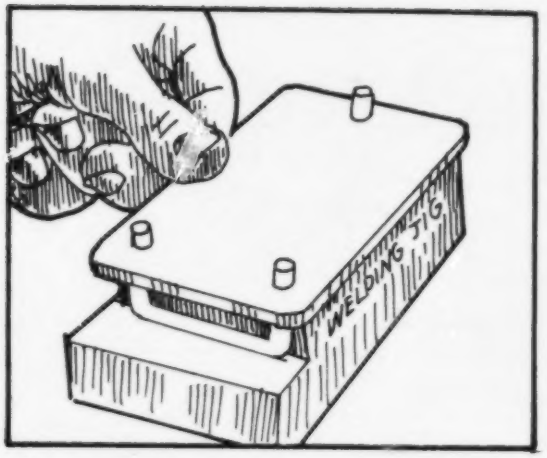
Given the proper tools, equipment and instruction, each student will safely weld the belt holder and hooks.



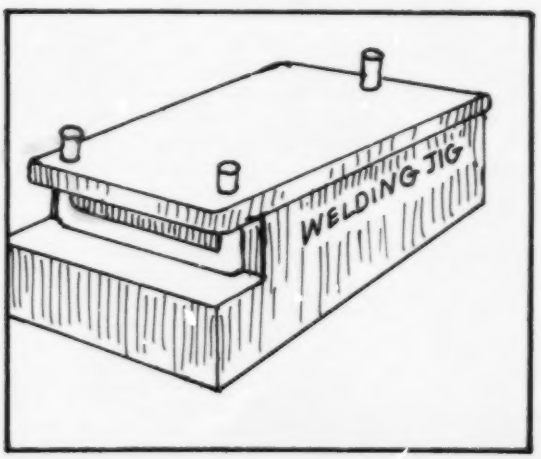
STEP 1 – Move to the Brown Area and obtain one welding jig.



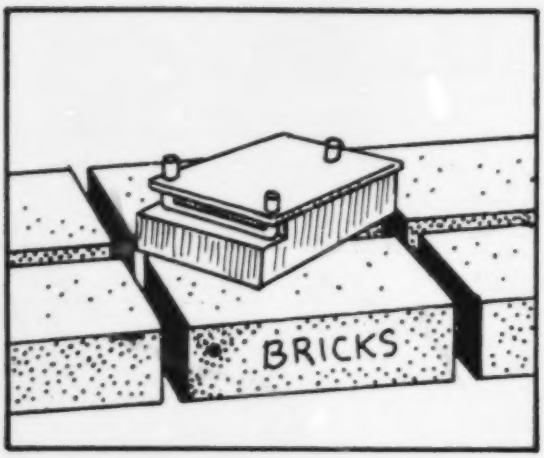
STEP 2 – Place the 1"(2.54 cm) piece of filler rod in hole located at top of welding jig.



STEP 3 – Place buckle blank on jig with 1" (2.54 cm) rod protruding through center hole.
NOTE – Belt holder is down.

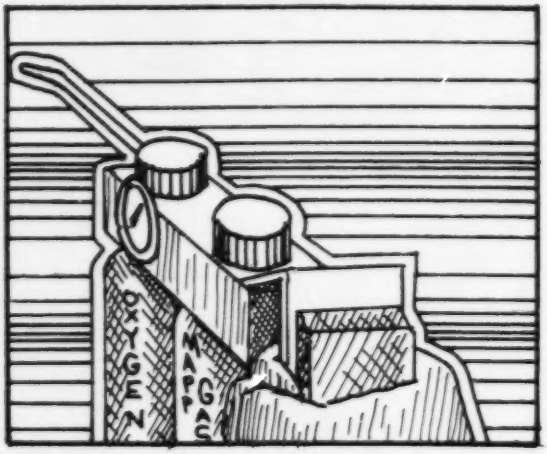


STEP 4 – Your belt buckle should look like this before you weld.

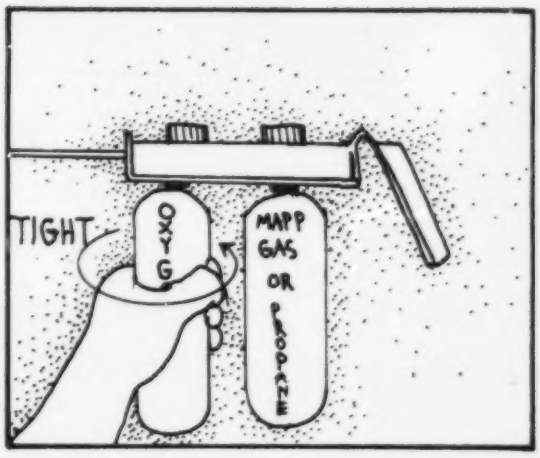


STEP 5 – Locate the welding jig on bricks in the welding area.

STEP 6 – Welding causes metal to become very hot. It is important that each student wear proper safety gloves and observe safe actions while in this area.



STEP 7 – Pick up the oxygen welding torch.

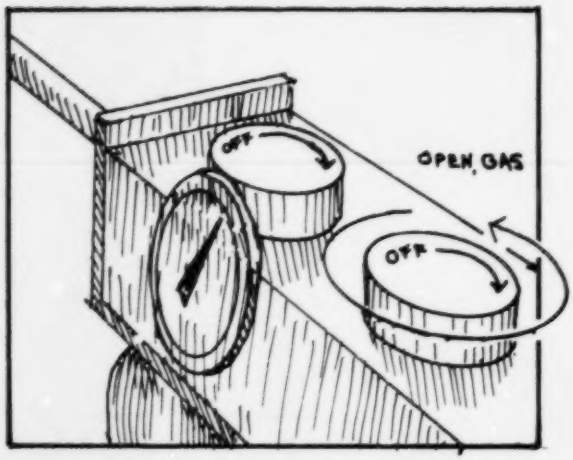


STEP 8 – Check both tank connections for a tight fit.

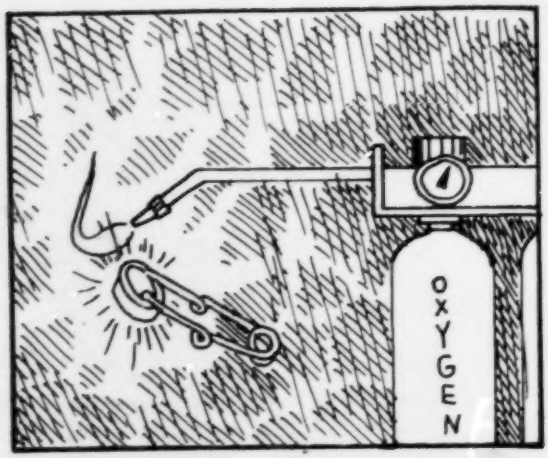
STEP 9 – Put on a leather apron,

STEP 10 – leather gloves,

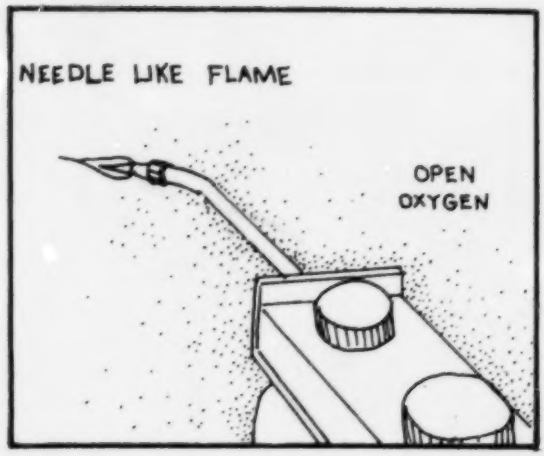
STEP 11 – and welding goggles.



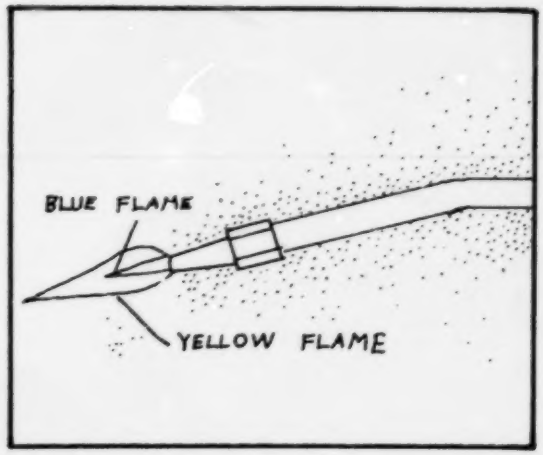
STEP 12 – Open the propane knob by turning it counterclockwise.



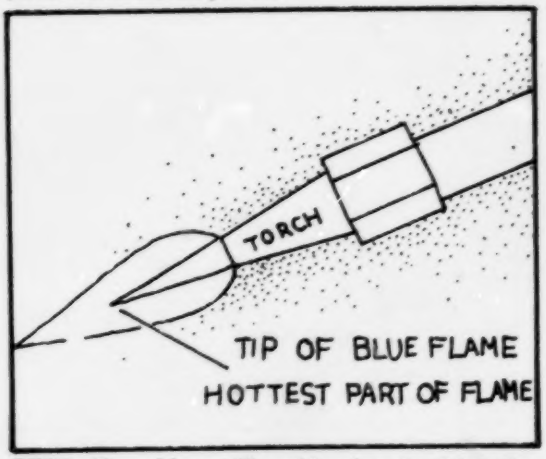
STEP 13 – Obtain a striker and ignite the gas by striking a spark near the tip of the torch.



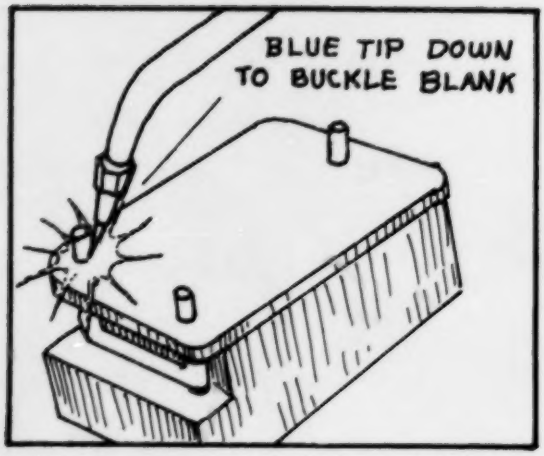
STEP 14 – Adjust the oxygen knob counterclockwise to produce a needle-like flame.



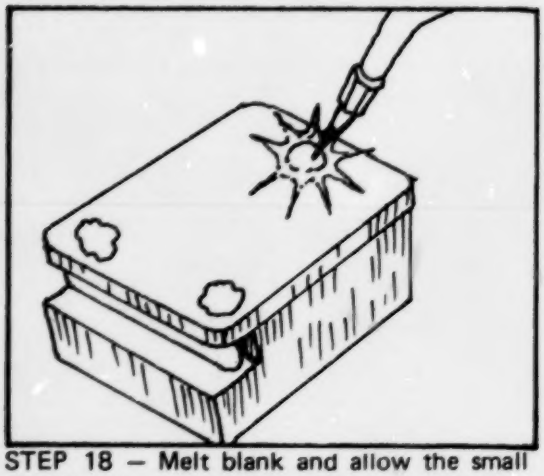
STEP 15 – This flame will have two colors, a yellow and a blue portion.



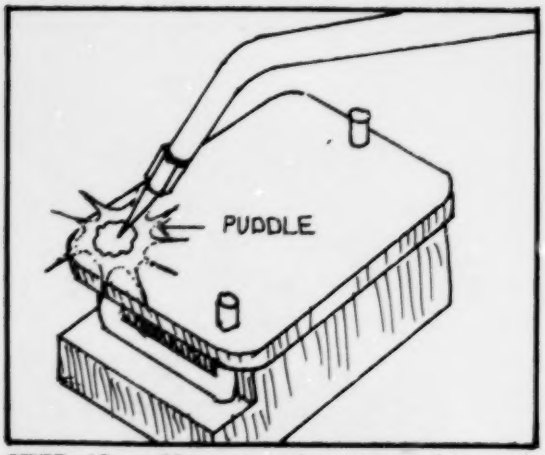
STEP 16 – You will weld using the blue tip of the flame; it is the hottest part of the flame.



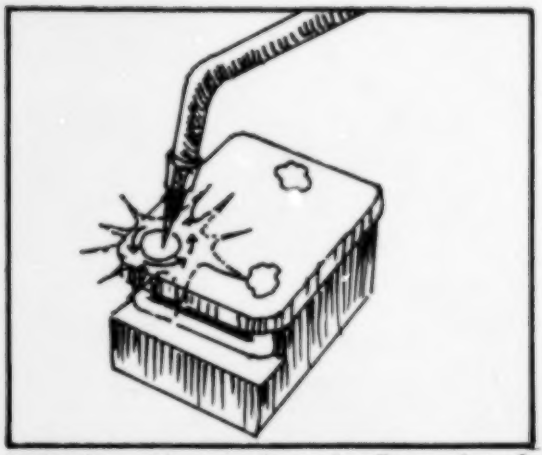
STEP 17 – Touch tip of flame to blank just on top of filler rod.



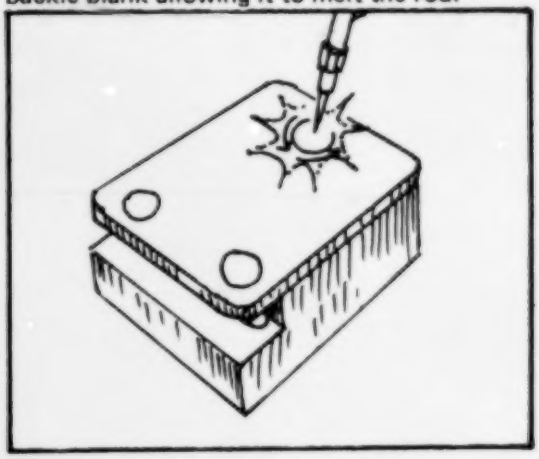
STEP 18 – Melt blank and allow the small puddle of metal to flow over and melt filler rod. NOTE – This is where the welding takes place which is called "fusion" welding.



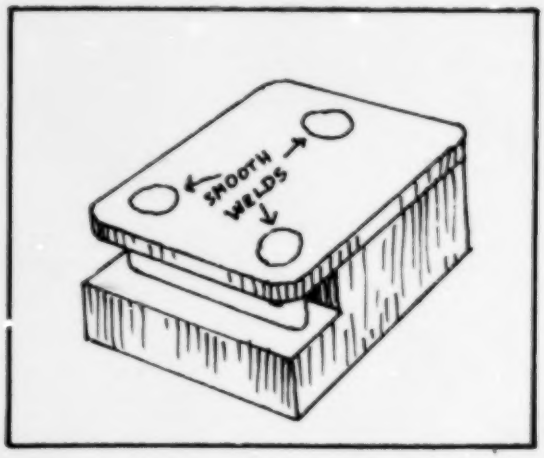
STEP 19 – Move to other two points and proceed the same way. NOTE – Remember that the tip of the flame is the hottest, and it must be touching the buckle blank to melt it.



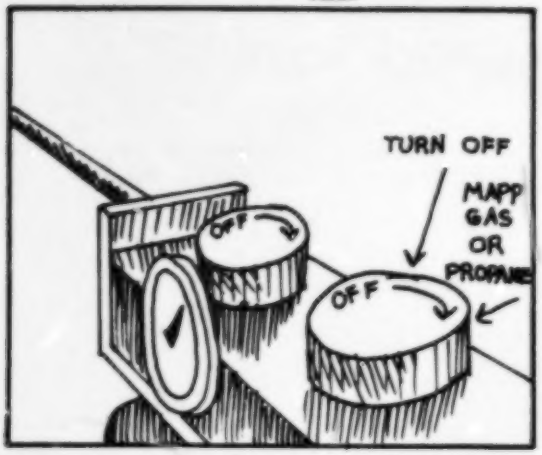
STEP 20 – Move back to the first point of welding and work around the rod, melting the buckle blank allowing it to melt the rod.



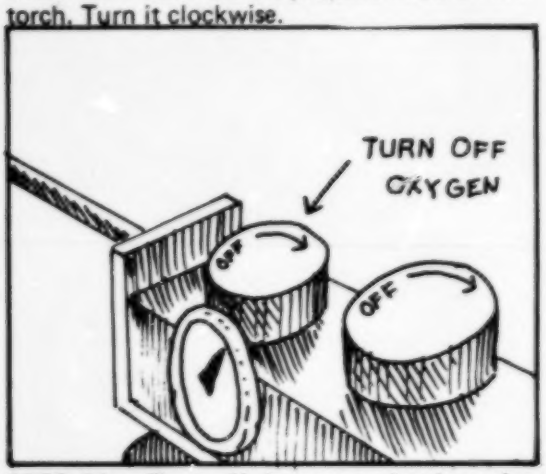
STEP 21 – Proceed to the 2nd and 3rd welding points and do the same.



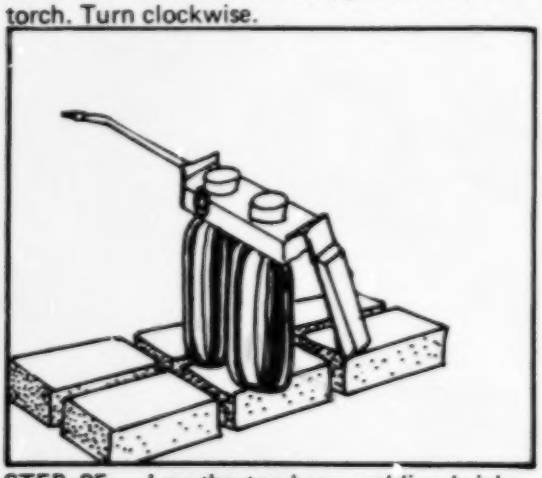
STEP 22 – Your welding should appear very smooth.



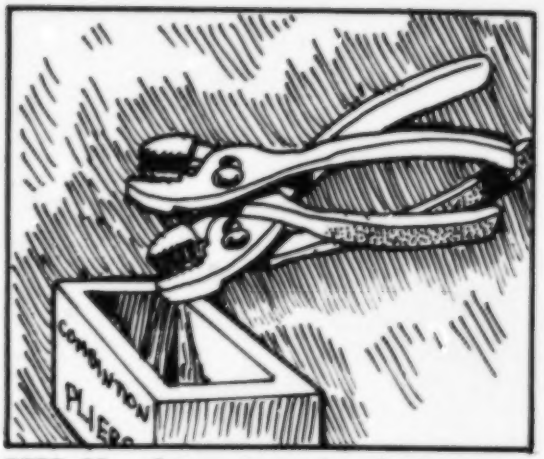
STEP 23 – Turn off the propane knob on the torch. Turn it clockwise.



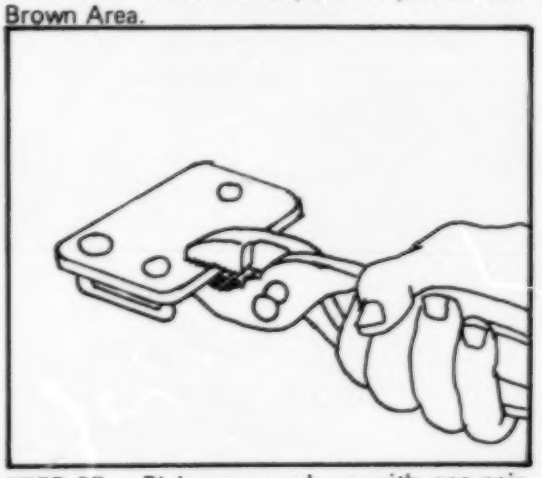
STEP 24 – Turn off the oxygen knob on the torch. Turn clockwise.



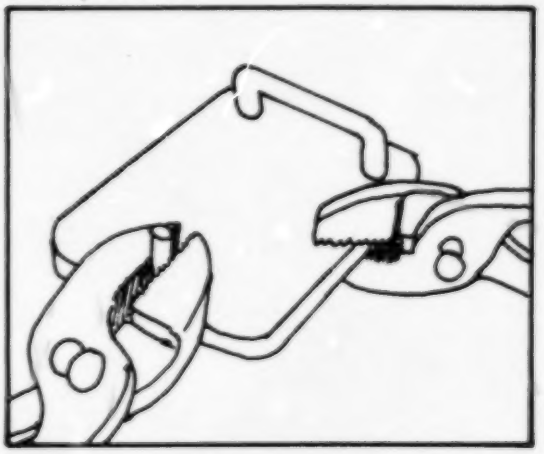
STEP 25 – Lay the torch on welding bricks. NOTE – It is very easy to melt the rod onto metal giving a nice appearance, but no welding has taken place. The filler rod will melt faster than metal, so care must be taken to MELT THE METAL, and let the METAL MELT THE FILLER ROD.



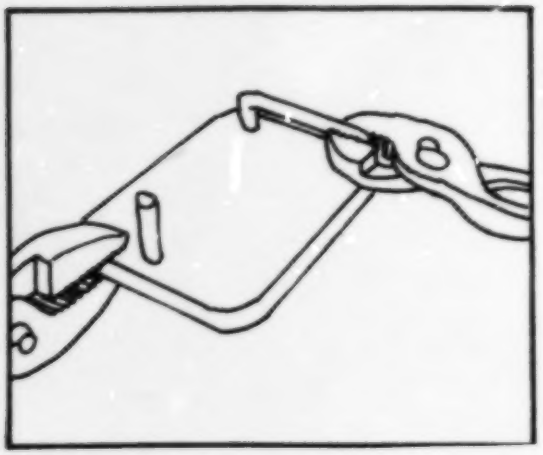
STEP 26 – Secure two pairs of pliers from Brown Area.



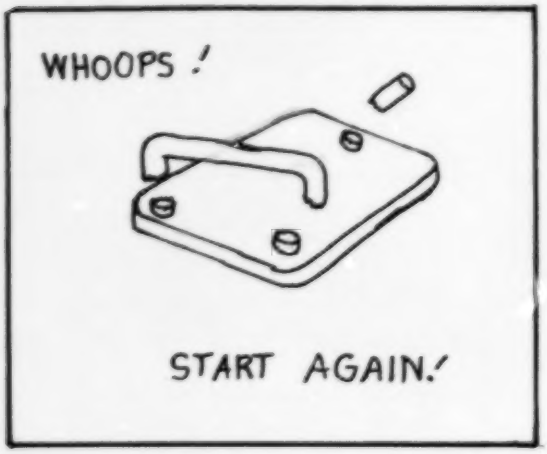
STEP 27 – Pick your work up with one pair of the pliers.



STEP 28 – With the other pair, clamp the hook (1" piece) (2.54 cm) and twist. Your hook or 1" piece (2.54 cm) should not turn in your buckle blank.



STEP 29 – Check the belt holder in the same manner. It should remain in the buckle blank.



STEP 30 – If your hook or belt holder is not welded to your blank, go back to Step 7 and start again.

STEP 31 – If your work is properly welded lay it on the bricks, and return pliers to the box labeled "Pliers."

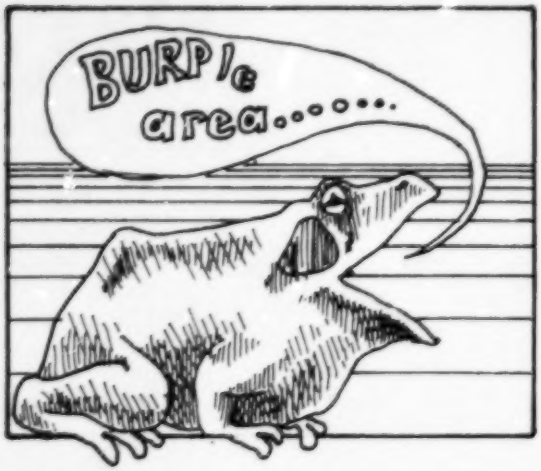
Check Point

Ask your instructor to inspect your work before proceeding to the Purple Area.

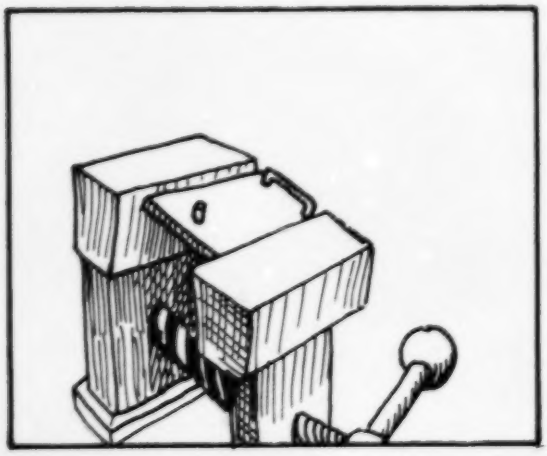
106

Instructional Objective VIII

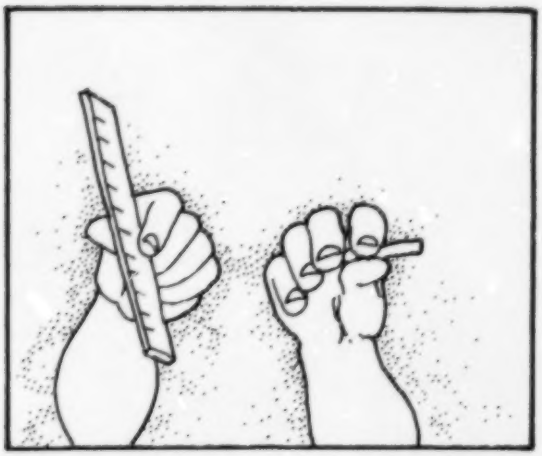
Given the necessary tools and equipment, the student will finish the back side of the buckle and prepare the front to be covered.



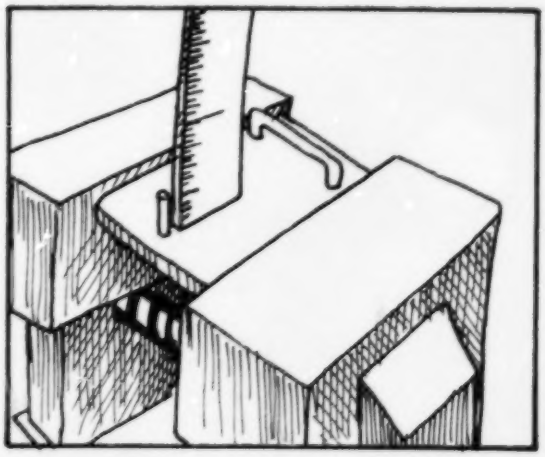
STEP 1 – Move to the Purple Area with your cooled buckle.



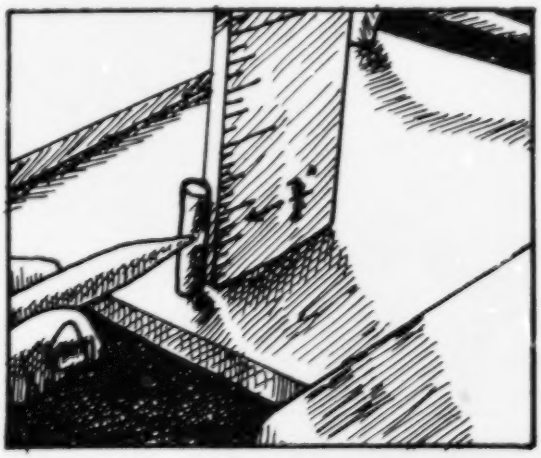
STEP 2 – Clamp the buckle in a vise with hook up.



STEP 3 – Secure one ruler and one piece of chalk from the Purple Area.

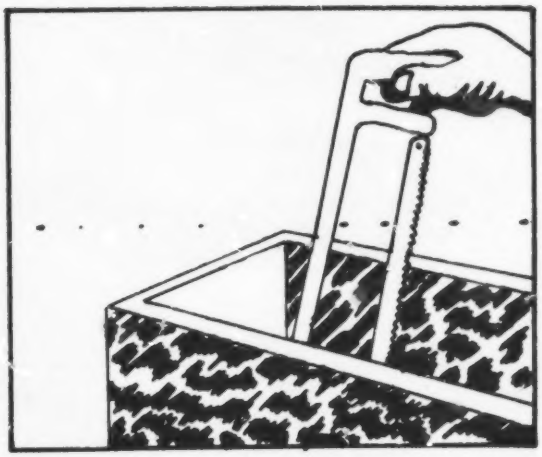


STEP 4 – Using the ruler, measure 3/8 of an inch up from the base of the hook. (.95 cm)

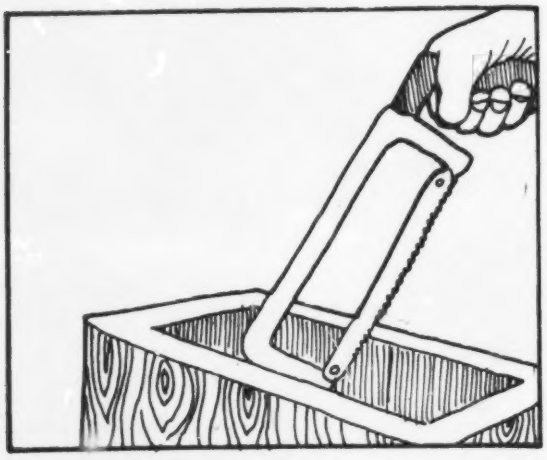


STEP 5 – Place a mark with chalk at 3/8 of an inch. (.95 cm)

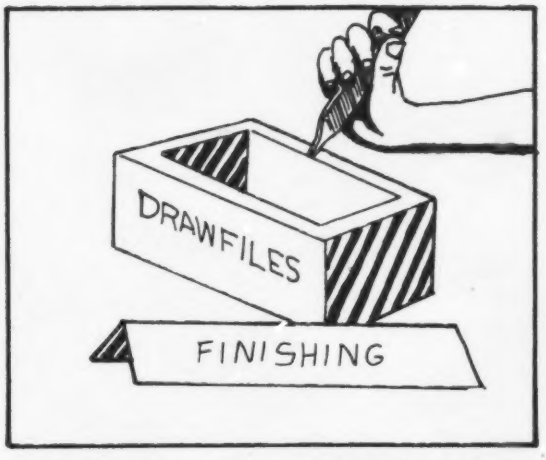
STEP 6 — Place ruler and chalk back in the labeled boxes.



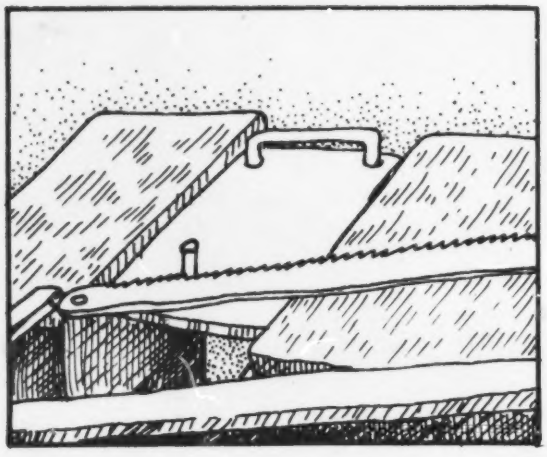
STEP 9 — Place hacksaw back in box labeled "Hacksaw."



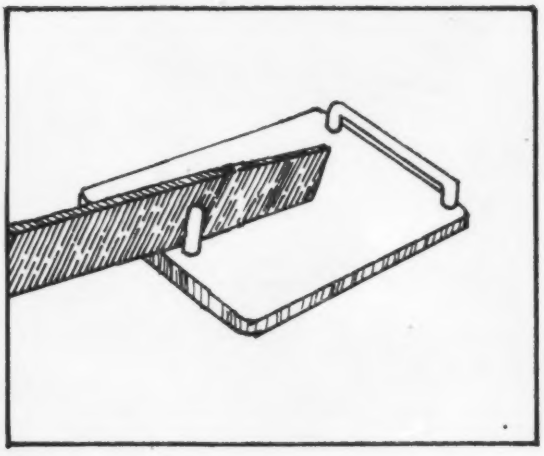
STEP 7 — Obtain a hacksaw.



STEP 10 — Secure one file from Purple Area.

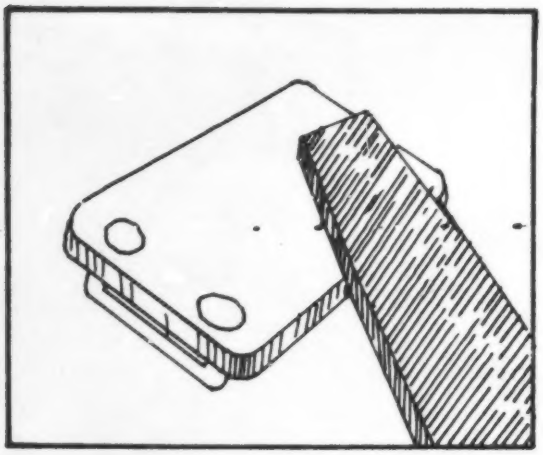


STEP 8 — Cut the hook off at chalk mark with hacksaw.

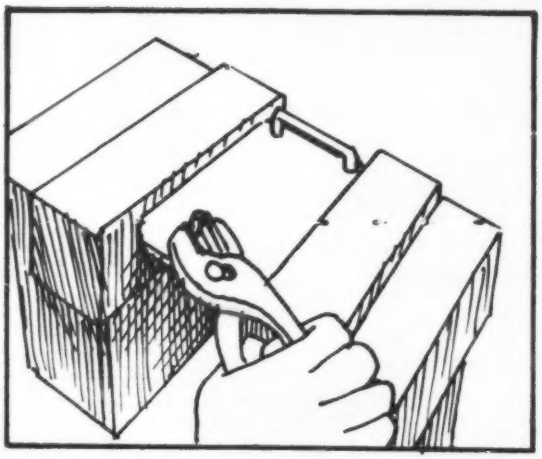


STEP 11 — With file, round end of hook. This should be smooth so it does not cut your belt.

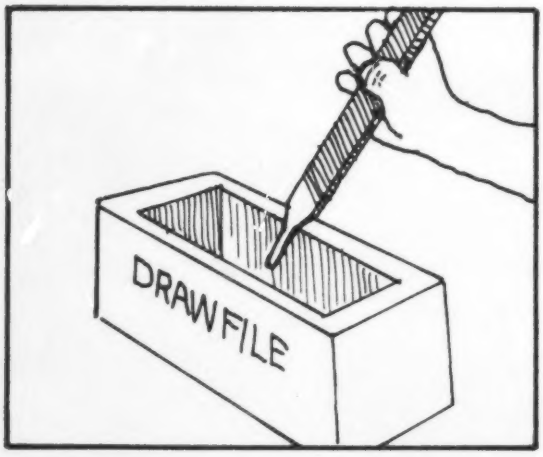
108



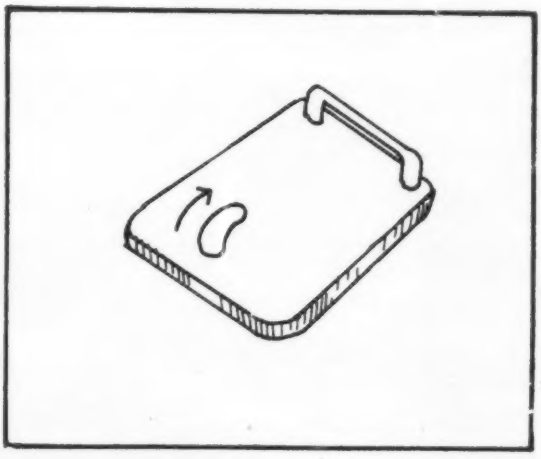
STEP 12 – File any rough spots on buckle.



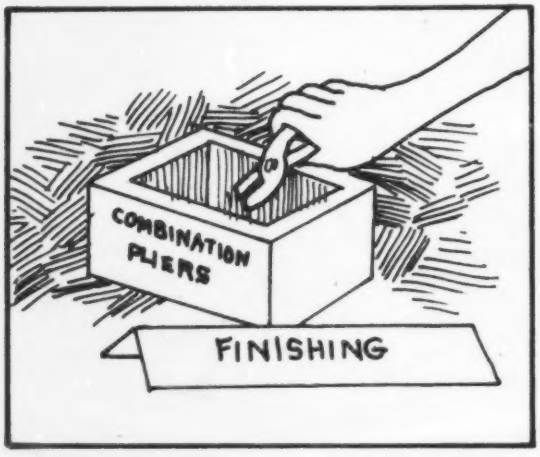
STEP 15 – Bend belt hook with pliers back toward belt holder.



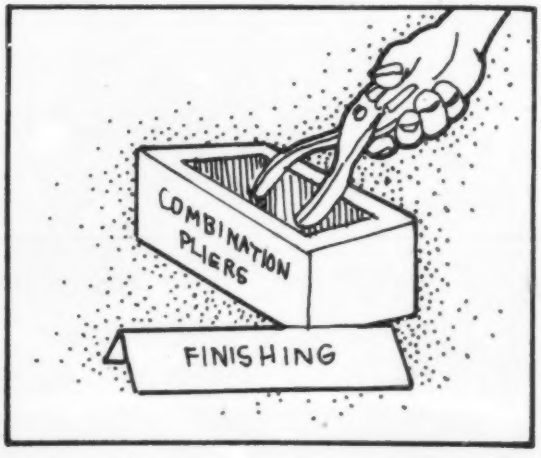
STEP 13 – Place file back in appropriate box.



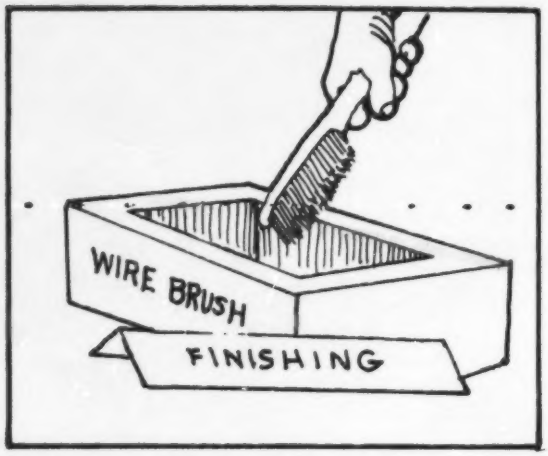
STEP 16 – Your belt hook should appear similar to the illustration.



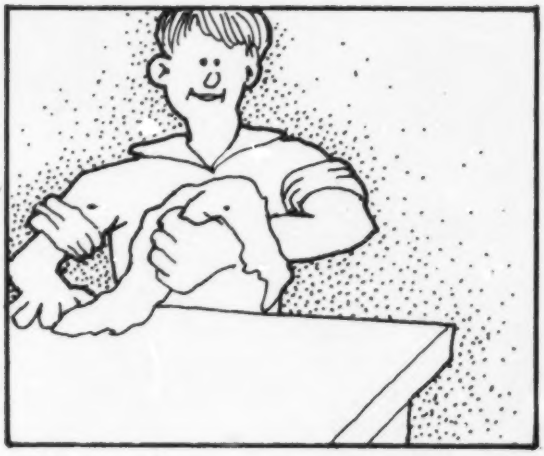
STEP 14 – Obtain one pair of pliers from Purple Area.



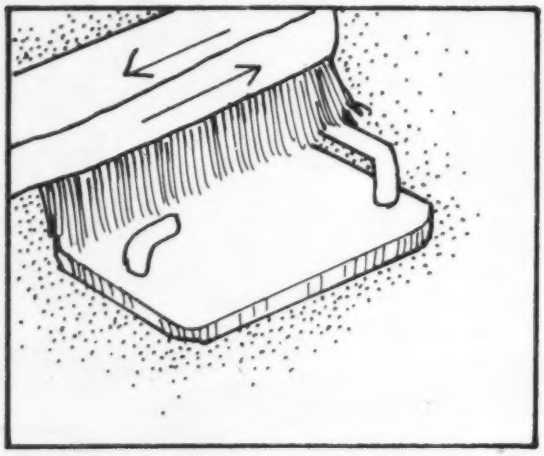
STEP 17 – Return pliers to labeled box in Purple Area.



STEP 18 – Secure a wire brush from Purple tables.

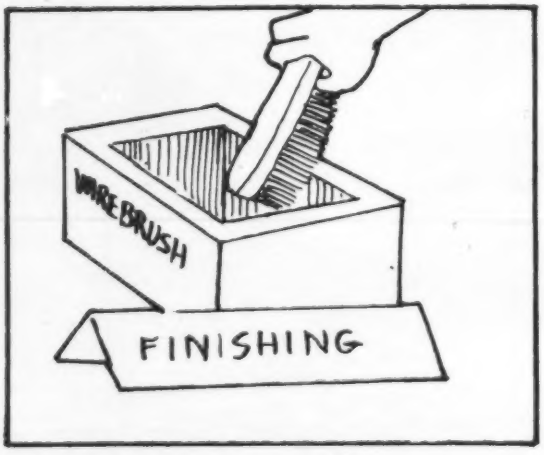


STEP 21 – Obtain a rag from Purple table.

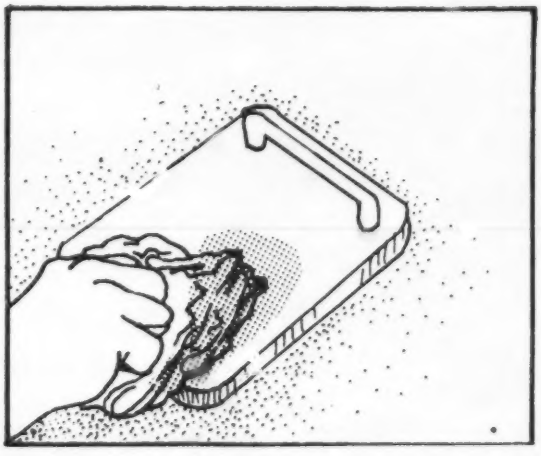


STEP 19 – Rub front and back side of buckle with brush.

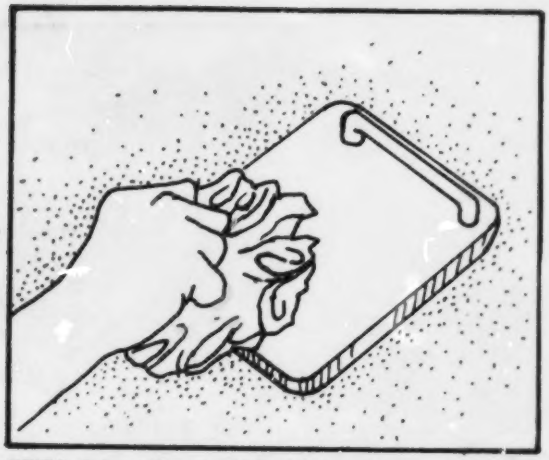
STEP 22 – Dip one end of rag in can labeled "Paint Thinner."



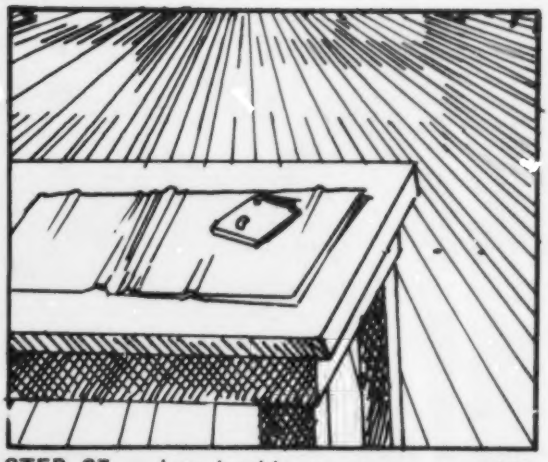
STEP 20 – Put brush back in proper place on Purple table.



STEP 23 – Wipe entire surface with rag.



STEP 24 – Dry buckle with other end of rag.



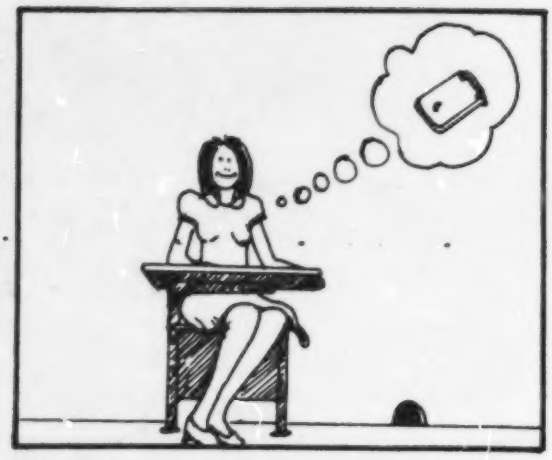
STEP 27 – Lay buckle on newspaper with back side facing up. NOTE – Newspaper should be located in well ventilated place. Example: near a window.

STEP 25 – Return rag to proper place on Purple table.

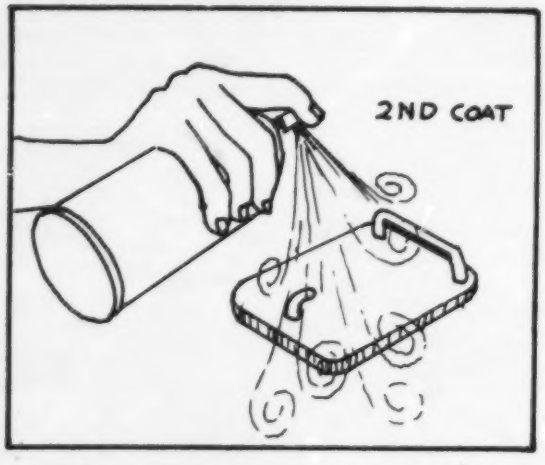
STEP 28 – Secure one can of spray paint from table.

STEP 26 – Read Safety Poster in Purple Area.

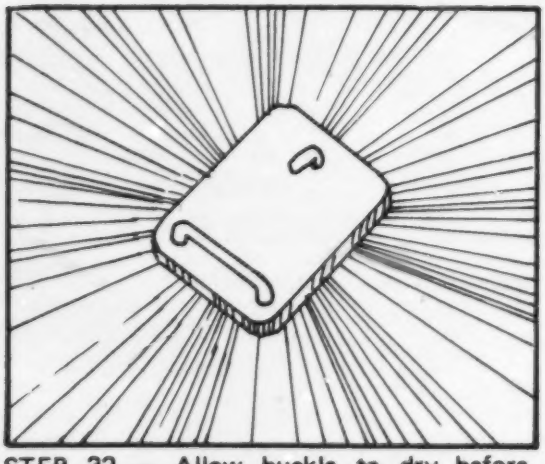
STEP 29 – Hold 6" to 10" (15.24 to 25.4 cm) away from buckle and spray a thin coat of paint over the buckle.



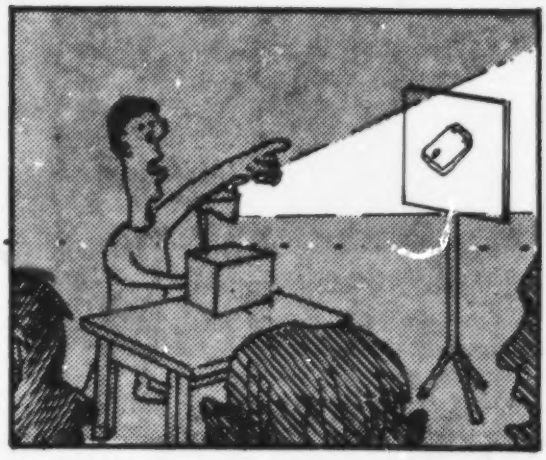
STEP 30 – Allow the first coat of paint to dry until it feels tacky.



STEP 31 – Spray on a second coat of paint.



STEP 32 – Allow buckle to dry before handling. NOTE – Do not spray the front side of buckle. You will be covering this with some type of material.



STEP 33 – Your finished buckle should appear similar to this illustration.

Check Point

Answer the following questions on the Purple Area checklist in your Checklist Booklet.

DO NOT WRITE IN THIS MANUAL.

Check "yes" or "no."

1. Did you smooth the end of the belt hook with a draw file?

   yes___ no___

2. Did you use a wire brush and paint thinner to clean your buckle?

   yes___ no___

3. Has your buckle dried?

   yes___ no___

Circle best answer.

4. Why do you bend the belt hook with a pair of pliers?

   a. so it will look more like a belt buckle
   b. so the hook will stay in your belt

After you have completed these questions, have your instructor check your work.

If you have successfully completed this checklist, sign your name on the cover page of this booklet, and turn it over to your instructor.

112

811.482-010 WELDING-MACHINE OPERATOR, GAS (welding) welder, gas, automatic.

Sets up and operates oxy-fuel-gas-welding machine to weld metal parts, according to work order, blueprints, layout, and operating charts: Clamps workpieces into holding *fixture* on machine bed, movable carriage, or turntable. Positions and clamps or bolts welding torch onto overhead carriage, radial arm, or into stationary fixture at specified angle and distance from workpiece. Turns cranks to align torch with weld line. Places reel of filler wire onto spindle and threads end through feed rolls to welding seam. Connects hoses from torch to regulator valves and cylinders of oxygen and fuel gas. Turns regulator valves to start flow of gases, lights torch, and adjusts gas mixture and pressure to obtain flame of desired size and color. Turns knobs to synchronize movement of torch or workpiece, feed of flux and filler with welding action, and sets switch to stop machine at end of weld. Starts machine, observes welding action, and examines weld for defects. Adjusts machine setup to vary bead size and other weld characteristics. May record setup and operating data. May reweld defective joints, using hand torch. May preheat workpiece in furnace. May lay out, fit, and tack-weld workpieces together. May operate machine equipped with two or more welding torches. May remove surplus flux, slag, and splatter, using wirebrush, portable grinder, and hand scraper.

811.684-014 WELDER, GAS (welding)

Welds metal parts, using gas welding equipment as specified by layout, welding diagram, or work order: Positions parts in *jigs* or *fixtures* on bench or floor, or clamps parts together along layout marks. Selects torch, torch tip, filler rod and flux, according to welding chart specifications or type and thickness of metal. Connects regulator valves and hoses to oxygen and fuel gas cylinders, and welding torch. Turns regulator valves to activate flow of gases, lights torch and adjusts gas mixture and pressure, to obtain desired flame, based on knowledge of gas-welding techniques. Holds torch at proper angle to metal and guides along weld joint, applying filler rod to molten area to form weld. Examines weld for bead size and other specifications. Repairs broken or cracked metal objects, fills holes, and builds up metal parts. May apply flux to workpiece instead of filler rod. May preheat workpiece in furnace or with torch. May layout, position and weld workpieces. May weld along vertical or overhead weld lines. May scarf or groove weld prior to applying filler metal, using gas welding equipment. May chip or grind off excess weld, slag, or spatter [GRINDER-CHIPPER (any ind.) II]. May clean or degrease parts, using wire brush, portable grinder, or chemical bath. May cut metal plates or structural shapes using gas torch. May be designated according to type of gases used such as WELDER, ACETYLENE (welding); WELDER, OXYACETYLENE (welding); WELDER, OXYHYDROGEN (welding). Important variations include type of metals welded, products, subprocesses, trade name of equipment, worksite (inplant, job shop, construction site, shipyard), high-production or custom, level of ambidexterity required or type of joints welded (seam, spot, butt). May be required to pass employer performance tests or standard tests to meet certification standards of governmental agencies or professional and technical associations.